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INTRODUCTION

The condition in which an absence of well-being and a lack of energy accompanies persistent abdominal symptoms of no known pathology, is one worthy of investigation. Never leading to a fatal termination it nevertheless assumes considerable importance from the mass of suffering and the loss of economic efficiency it produces.

Not that it has failed to receive consideration in the past; on the contrary, a vast literature has accumulated around this one condition. The magnitude of this literature is not obvious at first sight, and only becomes so when it is realised that conditions as diverse as nervous dyspepsia, nephroptosis, gastroptosis, visceroptosis, auto-intoxication, intestinal stasis, chronic appendicitis, caecum mobile, and others too numerous to mention, merely represent different interpretations of a single symptom complex. This view is forced upon one by an unprejudiced study of the clinical material as it presents itself in general practice, and the conclusion seems inevitable that some common whole must underlie these diverse manifestations.

In the past many investigators have come to the same conclusion. This they reached by an intensive and specialised study of one side of the problem, and for that reason, presumably, failed to obtain the general assent the facts deserved.

It has, therefore, seemed to me worth while to approach the problem from the wide angle of general practice. The latter offers a very special facility for the study of the condition, in that the genesis, progress and termination can be followed by one observer in a way not possible in any other branch of medicine.

THE CLINICAL PICTURE.

To portray the clinical condition in all its varied manifestations is no easy task, and I doubt if the words of Burton (92) in the "Anatomy of Melancholy" can ever be improved upon. He says - "In this hypochondriacal or flatuous melancholy the symptoms are so ambiguous that the most exquisite physician cannot determine of the part affected; sharp belching, fulsome heat in the bowels, wind and rumblings in the guts, vehement gripings, pain in the belly and stomach sometimes, after meat that is hard of concoction."

Cullen (153), writing of dyspepsia, merely puts the same idea into the formal language of science when he describes it as:- Anorexia, nausea, vomitus, inflatio, ructus, ruminatio, cardialgia, gastrodynia; pauciora saltem vel plura horum simul concurrentia plerumque cum alvo adstricta et sine alvo vel ventriculi ipsius vel aliarum partium morbo.

We do not find, however, a clear description of an individual case representative of the condition as we know it to-day until that reported by Abercrombie (2) in 1830. He describes a woman 18 years of age suffering for a year or more from a disordered state of the bowels accompanied by remarkable tympanitic distension. She was also affected with a variety of hysterical symptoms,

general weakness and impaired appetite. These symptoms continued, improving at one time, getting worse at another, until finally a second stage of the illness was reached. She now developed aphthae in the mouth and vomited from time to time thick white matter. The bowels became most obstinately constipated. This condition was accompanied by a sense of burning along the intestinal canal, and a sensation of sinking in the stomach. Thirst and headache were prominent. There was also pain in the right side of the abdomen and along the ascending colon. Much viscid mucus and a white substance would then be passed by the bowel. She would have for a few days almost normal movements whereupon the condition would recur. During these attacks the pulse never rose above 74-80. The bowel discharge varied from immense quantities of pure transparent jelly to long fibrous stringy matter and frequently large pieces of firm uniform tenacious membrane, often several inches long, in the form of a tube or enclosing small hard lumps of faeces. During the whole of this time the appetite was variable and the digestion bad. She would spend six or seven months in bed and then on removal to the country recover considerably. On her return to town she would relapse. Finally, she died of acute pulmonary tuberculosis. Abercrombie was able to examine her abdomen in which he found the organs

absolutely normal excepting the colon which was studded with numerous small white vesicles, the size of a pin's head, from which, when punctured, exuded a small quantity of clear fluid.

Clifford Allbutt (9) in his lectures on the "Visceral Neuroses", describing cases of gastralgia, enteralgia, etc., observed that these symptoms occurred in individuals of a temperament somewhat different from the ordinary. They were either hysterical, selfish and introspective, or else over conscientious, self-forgetful, and wearing themselves out for others. He regarded these different abdominal symptoms as manifestations of an abnormal central nervous system.

Glenard (233), impressed by the physical findings as well as the mental peculiarities which identified these cases, described a typical one as presenting:-

- (1) Asthenia and general depression.
- (2) A dragging feeling, a sense of weight or a sense of emptiness in the epigastrium.
- (3) A sense of burning in the stomach, sometimes accompanied by vomiting.
- (4) Neurasthenic symptoms.

Associated with them were the following physical signs:-

- (1) Deformity of the abdomen, flabbiness of its wall and a lack of resistance in the epigastrium.

(2) Splashing sounds in the stomach, epigastric pulsation, palpable kidney caecum, transverse colon and sigmoid.

Treves (593) in England recognised a similar type. The patient, he writes, usually a woman, complains of certain asthenic symptoms accompanied by general depression and a state of general ill health. A condition of invalidism supervenes, rendering her unfit for any exertion until she becomes only comfortable when recumbent. She complains of a sense of weight and a dragging in the abdomen. There is pain in the back and continued weariness with a burning feeling in the epigastrium, vomiting, loss of appetite, and distress after food. The bowels are irregular, and constipation tends to be the rule. Pain is complained of when they act and aperients cause distress.

On the other hand, surgeons like Lane (374) were impressed more by the physical condition of these patients than by its association with a mentality different from the average. They describe an individual, usually a woman, presenting atrophied breasts undergoing cystic change; staining and pigmentation of the skin; hair turning grey and falling out; profuse offensive perspiration and a subnormal temperature; coldness and lividity of the extremities, wasting of subcutaneous fat and premature senility.

The extreme cases Lane described were so very

few that they did not truly represent that large number of "painful women" as Cabot (99) describes them. They complain of one or more varieties of pain situated in their "midship section" which might be due to an organic lesion of one of the organs between the diaphragm and the floor of the pelvis, but is not.

These have been more successfully pictured by Hutchinson (309). He describes the patient as more often a woman, generally a spinster, or else childless and in comfortable circumstances who develops many varied and ever renewed symptoms. They fall into two groups, one relating to the abdomen, while the other consists of symptoms more remote and general in character. These are described in great prolixity and in minute detail. Pain is very frequently complained of in the right iliac fossa or else a raw feeling inside. An indescribable sensation in the stomach and a dragging generally are also predominant symptoms. Constipation is more or less absolute and flatulence is frequent. General weakness or exhaustion is present, especially after a bowel action. Mental and physical torpor, inability to think, a poisoned feeling and neuralgic pains all over, are common. Headache and insomnia, undue susceptibility to cold, and constant catarrh in the throat complete the picture.

While these descriptions portray the advanced stage of chronic intestinal invalidism, they do not

reveal the individual in the earlier stages of the complaint, such as he or she is when first seeking medical advice. Moreover, the earlier stages or milder degrees of the complaint do not show the extreme disproportion between the sexes which has been stressed by most writers on the subject. The patient comes complaining of digestive symptoms and general ill-health. Careful routine physical examination fails to reveal any abnormality, excepting poor nutrition and more or less obvious fatigue. Not infrequently an individual may be stout, but if so, is characteristically flabby. In most cases they are thin, looking and feeling ill, both mentally and physically. On inspection the individual, as a rule, presents the posture of fatigue, somewhat bent, with collapsed lower thorax and protuberent lower abdomen. The pupils are usually dilated, while the respiration is rapid and frequently irregular. The skin is likely to be dry, often rough, and usually of a "muddy" colour. In the stout person, the fat, instead of being firm and retained in position by the tissues, is soft and "flows". The muscles are small, of poor tone, and as lacking in resilience as is the subcutaneous tissue. Abdominal examination may be difficult at first on account of a strong spasm the moment the palpating hand touches the abdomen. With patience, the spasm will pass off to reveal a toneless

musculature, through which it is easy to palpate the abdomen unless there is present generalized gaseous distension. If not, gurgling is constant in the region of the caecum and ascending colon, or in the left iliac region from a distended sigmoid loop.

On the mental side, the most characteristic finding is a constant over reaction to stimuli of all kinds. These patients are in a state of perpetual mental unrest, which is reflected in their changeability, lack of concentration, and difficulty in securing restful sleep. In women, the manifestations of apprehension or suspicion may be displayed with frequent floods of tears. They complain of poor or capricious appetite, intermittent abdominal pains and flatulence, from which they find great difficulty in getting relief. Constipation is the rule. Finally, the picture is completed by signs of vasomotor instability; excessive flushing of the face on the slightest provocation contrasting with its pallor in repose; tachycardia; cold and moist extremities; excessive sweating.

In the very severe cases nervous energy has been wasted at such a terrific rate that physical rest is enforced by a state of collapse, accompanied by nausea and vomiting.

Clinicians were not content with merely describing the condition; they naturally sought for

an explanation on a pathological basis. The earlier attempts culminated in the classical work of Glenard, and in the succeeding sections I propose to review the different theories by dividing them into three main groups, namely those which appeared before Glenard's work, Glenard's own theories, and those which have appeared after his influence had waned. This division is a very useful one, since his influence continued to the beginning of the present century, in the opening years of which, new methods of investigation were introduced which revolutionized all previous concepts of the subject.

AN HISTORICAL OUTLINE OF THE PROBLEM
BEFORE GLENARD.

The early anatomists regarded the abdominal viscera as possessing a definite unalterable form, and occupying a fixed position, any departure from which was presumed to be abnormal and duly recorded as such. Thus we find Franciscus de Pedemontanus (495) describing a dislocated kidney, and Riolan (517), not only recording a similar observation, but suggesting as a cause absorption of the perirenal fat. Both Riolan and Spigelius (570) observed post mortem, localised narrowings of the gut, "agony contractures", which they suggested might occur during life, and by obstructing the passage of faeces produce, what we would call to-day, abdominal symptoms.

The works of Antonii de Haen (260-1) have several plates showing abnormalities of the hollow viscera. In Vol. X Plate I is depicted a Lane's kink, in Plate 2 an undescended caecum, and in Plate 3 the transverse colon looping downwards below the umbilicus. In Vol. XI, Plate 3 there is an excellent picture of the hepatic flexure showing what the French call "canons de fusil".

Lorenz Heister (271) in 1739 reported finding a liver dislocated into the abdomen.

Morgagni (465) a little later describes no less

than twenty autopsies in which he found the stomach and colon abnormally low. In Book III, Letter XXXIV, Sec. II (*de intestine dolore*) he says he has not mentioned anything like all the cases observed by him, and that they are far more common than is generally believed. He was the first to suggest that these deformities may be of congenital origin (*Adv. anat. II. 14*). In this view he was supported later by Fleischman (202), who in 1815 confirmed his observations.

Annesley (24), on the contrary, believed that those abnormal positions were frequently due to an unusually long colon stretched by the weight of impacted faeces in constipated individuals. Esquirol (191), on the other hand, had noted abnormal positions of the hollow viscera as a frequent finding in autopsies on patients who had suffered from melancholia during life. He concluded that these were due to the general flabbiness of the tissues characteristic of melancholics.

In 1825 Matthew Baillie (31) was the first to report the palpation of a moveable kidney in a healthy woman. A year later Aberle (3) published four autopsies where the kidney, palpable during life, was verified to be unduly mobile post mortem. He also noted in all four that the other abdominal viscera occupied an unusually low position. Girard (228) in 1837 distinguished between a moveable

kidney and a floating kidney i.e. one completely surrounded by peritoneum forming a true mesentery. Rayer (507) increased our clinical knowledge of the subject by pointing out that moveable kidney was commoner on the right side than on the left, commoner in men than in women, and usually found in association with hypochondriacal symptoms. He claimed that by holding the kidney in position with a suitable belt these symptoms might be relieved.

Cruveilhier (152) in 1849 gave a fairly precise account of the dislocation of the abdominal viscera, particularly of the transverse colon which, he says, may zigzag across the abdomen or else loop down en masse into the pelvis. Where this deformity is not due to traction by tumour or adhesions, he suggests the deforming affect of corsets on the liver as the cause; the descent of the intestine being secondary to the downward elongation of that organ. He also noted that in many cases an abnormally long transverse colon was really the result of the ascending and descending portions being unduly short.

Although in 1836 Rokitanski (524) had noted the association between adhesions and bowel displacement, Virchow (606) was the first to elaborate a theory to explain it. He assumed a localised chronic peritonitis starting at the root of the mesentery in the region of the last lumbar vertebra and at the flexures. As the exudate organised, and the fibrous

tissue contracted, various deformities and malpositions of the gut resulted. The cause of the local peritonitis was trauma from hardened faeces, or where the faeces were too fluid, from some chemical action. It may be noted in passing that Virchow completely abandoned this theory, and in 1890, according to Blad (66) wrote: "In almost all adults, partial states of dislocation of the viscera and especially of the intestines occur so frequently that more people have displacement than a normal location of the intestines".

Engel (188) in 1860 discussing the influence of corsets on the thorax and abdomen described various deformities which resulted from tight lacing. He assumed that the liver, becoming elongated by the pressure of the corset, produced a downward dislocation of the hepatic flexure, ascending colon, and caecum. The transverse colon then formed a downward convex curve, which descended from the right crest of the ilium to reach the symphysis pubis, and from there ascended on the left side to 3-4 fingers breadth above the crest, though never so high as in a healthy person. About the same time, Frerichs (212) made similar observations and did much to popularize the corset theory of visceroptosis.

In 1866 appeared the first monograph devoted solely to the dislocation of an organ, that of Rollet (526) on the kidney. In 1870 Chroback (126)

suggested moveable kidney as a cause of hysteria. With the appearance of Landau's (370-1) monograph in 1881 there started such a flood of literature on nephroptosis that by 1897 A. Macalister in his article in Allbutt's system, Vol. IV, ps. 350-1, was able to compile a carefully selected bibliography of 151 articles devoted to this condition alone.

Cantani (108) in 1866 reported a case where the whole liver was dislocated downwards and lying mobile in the abdomen. Ten years later, Blet (67) collected ten cases from the literature, and a year later Wickham Legg (391) reported another twenty along with a supposed case of his own. At the post mortem, however, what was thought to be the liver, proved to be a kidney tumour.

This finding led Legg to doubt the existence of such a condition as hepatoptosis, since none of the reported cases had been confirmed post mortem. In 1885 Landau (371) published a monograph on this condition which he assumed to be due to an unduly pendulous abdomen. This was quickly followed by that of Kuther (366). Landau also differentiated a virginal type of patient, excessively thin, from a maternal type excessively fat, in both of which the abdomen might be pendulous from muscular weakness. The latter type had been noted previously by Gueniot (257), who also recognised it as a cause of

hepatoptosis (258).

Although both Riolan and Morgagni had noted that the spleen occasionally may be found dislocated, there is no further reference to it until Kuchenmeister's (428) description in 1856. Clinically a floating spleen is a somewhat rare condition and Glenard (233) noted that it had only been found once in every 200 cases of visceroptosis seen by him. It's real importance lies in the fact that such a spleen is very liable to undergo torsion round its pedicle and produce the symptoms of an acute abdominal lesion. Hence most of the information regarding it has come from the surgeons, like Vulpian, who collected all the cases reported up to 1894, and Mayer (428) to 1899. Since torsion is a purely surgical condition splenoptosis has never assumed much importance in the purely medical literature; hence it will not be referred to further.

As regards the stomach, it has already been mentioned that Morgagni noted it's very low position in certain of his autopsies; but to Meckel (440) belongs the credit of observing that the stomach frequently occupies, especially in women, a vertical position instead of the classical horizontal one.

Klebs (351) gives a description of a case of gastropptosis, where the form of the stomach agrees with the hook-shaped form subsequently pointed out

by Hertz (280) to be its normal shape. Kussmaul (365), who also noted these apparent abnormalities, was the first to attach clinical importance to them and suggested they were the cause of certain dyspeptic symptoms.

From now onwards utter confusion seems to have involved the whole question of gastroptosis. Kuther and Dyer (367) in Germany, and Bouchard (76 G. See 550) and Mathieu (423-4) in France, who were investigating the motor function of the stomach by use of the stomach tube, started the confusion by assuming that a low position of necessity indicated atony and dilatation. It is only within recent years the situation has been clarified by the aid of radiology.

In 1885 appeared Glenard's (229) communication to the Institute, in which, for the first time, it was suggested that this condition of prolapse of the abdominal viscera was intimately connected with certain local and general symptoms which had been previously described as separate clinical entities.

To this hitherto badly defined group of cases with dyspeptic and nervous symptoms he proposed giving the name enteroptosis. This name was chosen because he regarded the descent of the colon as the most prominent feature of the general prolapse, and it is always used by him as synonymous with visceroptosis. Since then the condition has been

called by various names, Glenard's disease, visceroptosis, splanchnoptosis, etc., and has aroused such widespread interest that by 1903 Blad (66) in his monograph refers to no fewer than 800 separate articles dealing with the subject.

By 1912 Burckhardt (91) was able to collect several hundred more published in the interval. From this date onwards, judging by the lessened output of literature, interest in the condition, as such, has begun to wane, and excepting those of Dagna (156), Arlotta (26), and Ferrari (198) in Italy, Longyear (404) and Coffey (135) in America, and Knapps (355) in Germany, no recent monographs have appeared.

GLENARD'S THEORIES AND THOSE EVOLVED
UNDER HIS INFLUENCE.

It is no easy task to give a brief outline of Glenard's enteroptosis theory. In some thirty, more or less voluminous, articles and monographs appearing between 1885 and 1899, Glenard advances from a purely mechanical conception of visceral displacements to a "hepatism" theory, according to which, these displacements are the result of functional changes in the liver.

In his early work he assumes that the general health and digestion depend upon a state of mechanical equilibrium existing within the abdomen. The digestive tract, being about fifteen times as long as the distance from mouth to anus, must wind to accomodate itself to the abdominal cavity. At the points of winding, i.e. the flexures, the tract is more securely suspended from the posterior abdominal wall than elsewhere. These two facts readily explain how easy it is for normal function to be disturbed. Thus, for instance, if the contents of a loop of intestine be too much or too little in amount, the flexures will be altered from their normal rounded form to an acute angle, which will form an obstacle to their passage onwards. Stasis will result, and the loaded bowel will now drag upon the flexures. The first to give way is

the hepatic, since it is the most loosely attached of all. In descending it will pull upon the pyloric end of the stomach, obstructing that organ by the kink produced. As it descends further, it will pull down with it the transverse colon, which in its turn obstructs the pylorus still more, so that the stomach now dilates. A series of kinks then develop, and a condition results in which we have a loop of bowel, distended in the part proximal to, and contracted in the part distal to, each point of obstruction. Thus enterostenosis is added to enteroptosis. He assumed that the solid viscera are retained in position by the pressure of the gas-filled loops of intestine. When these undergo enterostenosis, the number of gas-filled loops becomes fewer and the solid viscera, now losing their chief means of support, drop. In his earlier work he makes it quite clear that the symptoms depend, not upon the position of the viscera, but upon the stasis resulting, exactly as Lane does at a later date.

From time to time, Glenard gradually moved further away from this mechanical explanation. While at first regarding flaccidity of the abdominal walls as playing some part in the descent of the viscera, he subsequently denied it. Finally he came to regard the primary factor in enteroptosis to be a reduction in the intestinal volume brought about by perverted liver function. When the amount

of gas in the alimentary canal lessens, the gut contracts and places itself against the posterior abdominal wall. The small intestines come to lie in the pelvis, the transverse colon passes across the abdomen below the umbilicus as a thin cord, the "corde colique transverse", the sigmoid becomes palpable as a thin cord in the left iliac fossa, and the abdominal aorta can be felt pulsating as if it were immediately behind the anterior abdominal wall. He assumed that one of the functions of the liver is to regulate the gas content of the bowel through the coeliac plexus. Therefore, when the liver is functionally deranged it will produce the empty contracted condition of the bowel which leads to obstruction and ptosis. This functional derangement of the liver or "hepatisme" may be hereditary or acquired. It may remain latent until toxæmia, infection, emotion, or trauma stirs it into activity. This theory, unsupported by a single pathological fact and based entirely on clinical observation, failed to gain many adherents outside France. But there it persists to this day, and in its present form is expressed by Monod (458) thus: "By hepatism is meant a diathesis, hereditary or acquired, characterised by inadequacy of the liver cells. A vicious circle is thus created, since the poisons which are no longer detoxicated by the liver react in turn on its cells. Disturbance of the intra-

hepatic circulation follows, and in sequence to this there arises a like disturbance in the circulation of the bowel. The subsequent effects observed are: a diminution in the muscular tonicity of the gut and a lowering of the intra-abdominal pressure. Reduction in the lumen of the intestines then takes place, followed by enteroptosis, beginning at the hepatic flexure".

While Glenard's theories failed to win many supporters, the wealth and accuracy of his clinical observations compelled attention. Krez (364) and Ewald (192) in Germany, with Debove (164), Montenuis (459) and Mathieu (425) in France, early recognised their importance. A few years later Lund (405), Einhorn (184), Meinert (441), and Dole (168) recognised the condition in America, but it was not until 1896 that Treves (593) wrote the first paper in England on the subject, followed by Gardner (217) and Bruce Clark (129) in the same year. They, along with Tuffier (596) in France, assumed that in these cases there existed a constitutional congenital weakness of the tissues of both abdominal wall and mesenteries. These stretched under strains and stresses ineffective in a normal individual. Stiller (573-4) elaborated the constitutional aspect of the condition, suggesting a congenital weakness, both physical and psychical, whose stigma was a floating tenth rib which he claimed to be present in

all his cases.

Obrastow (485) by percussion and palpation noted a relationship between body-build and the position of the stomach, observing that normally it tended to lie much lower in long thin individuals than in short broad ones. He regarded the loss of tone in the abdominal muscles, the loss of peritoneal fat, and an associated state of neurasthenia as the cause of the symptoms, and not the low position of the abdominal viscera. As the result of continued observation, Mathieu (427) also came to disagree with Glenard and pointed out that the symptoms of enteroptosis might be met with in individuals who shewed none of the changes in the abdomen supposed to be pathognomonic, and moreover, that in many of them the abdominal wall appeared quite firm.

This led to a revival of the "corset theory" at the hands of Chapotot (120), Hayem (270) and others. These writers suggested that the pressure of the corset might produce severe visceral dislocations even in the presence of a firm abdominal wall. Fuchs (216) and others, however, shewed that visceral dislocations might be found in young women who had never worn corsets. None the less, the majority of writers on the subject continued to regard weakness of the abdominal wall as the chief factor in the production of ptosis, and they sought some other explanation of this weakness where it could not be

shewn to have resulted from repeated pregnancies, ascites, or any other definite known cause. Thus Schwerdt (546-7) held that in many cases it resulted from a disturbance in the innervation of the abdominal muscles. Wolkow and Delitzen (639) agreed with him. They claimed to show that the abdominal wall regulated the intra-abdominal pressure, and that only when the latter fell below a certain point did the viscera drop and symptoms arise. Yet ten years previously Weisker (618-9) had demonstrated that the intra-abdominal pressure, in the sense of a retentive force, is insignificant. Several years had yet to elapse before it was conclusively demonstrated that the intra-abdominal pressure is negative, and not positive, and that the abdominal wall plays no part in retaining the viscera in position.

Rosengart (529) suggested that the condition was really a reversion to the foetal type, and Kraus (361) concluded that this was due to a failure of the thorax to undergo full developement. He had noted the clinical condition in individuals whose abdominal walls appeared to be perfectly well developed, but whose thorax, being abnormally long and narrow, did not allow the viscera to ascend normally into the upper abdomen.

Keith (339), also struck by the form of the thorax in these cases, published a theory which he has little modified in the course of years. He

regards Glenard's disease as essentially due to a vitiated method of respiration. The viscera in the upper segment of the abdomen, covered by the diaphragm, acts as a piston. On inspiration the diaphragm pushes this piston downwards and forwards; on expiration the abdominal muscles push it upwards and backwards. At all stages of respiration this piston is delicately poised, and the ebb and flow are so finely adjusted that the slightest disturbance in the mechanism of respiration will result in a displacement of the organs forming the piston. This displacement will then pull or push the hollow viscera out of position. Latterly (343) he has somewhat modified this view, and has come to regard the transversalis muscle as the most important factor in regulating the piston action, and in holding the viscera in position. He supposes that when we assume the erect posture the viscera drag on numerous Paccician-like corpuscles at the roots of the mesenteries. This stimulus initiates a reflex mechanism which throws the transversalis into contraction to "gird our loins". He suggests that through faulty feeding and unhygienic living, this mechanism breaks down and the unsupported viscera then drop.

The last theory to be mentioned in this section, though elaborated after the introduction of X-rays, is a logical continuation of the above and so will

be considered here. It is that of Agnes Viator (600-3) who believes the fundamental cause of visceroptosis to be an abdominal incompetence from a failure in normal development. This displays itself not only in the shape and size of the abdominal cavity, but also by a defective visceral fixation. The most constant departure from the normal is a retracted lower thorax. She claims to shew that the developmental evolution of the human type is not completed at birth, and that variations in these developmental processes may be observed progressing throughout life. These processes may reach normality, may be retarded, uncompleted, or undergo reversion, and thus produce varying grades of visceroptosis.

Cameron (101), however, working on similar material, has shewn that the relations and positions of the various abdominal viscera are fixed at the end of the third month of intrauterine life, and that no further alterations occur, except in the position of stomach and caecum which remain essentially mobile organs throughout life.

In 1898 Boas and Levy Dorn (72) for the first time employed the opaque meal in the radiological investigation of the gastro-intestinal tract in man. By 1900 its use had become universal, and the lessons learnt from it have rendered the majority of these hypotheses no longer tenable.

THEORIES WHICH HAVE APPEARED SINCE THE
INTRODUCTION OF THE RONTGEN RAYS.

The present century has contributed to the study of visceroptosis along three main lines: radiological, anthropological, and surgical.

The first two have borrowed so extensively from each other that it is preferable to discuss them together. On the other hand, the surgical contributions require separate consideration, since the surgeon, while not disdaining the aid of radiology, has in the main preferred to be guided by his own operative findings.

(I) THEORIES BASED ON RADIOLOGICAL AND
ANTHROPOLOGICAL EVIDENCE.

The opaque meal for the first time enabled the living stomach to be visualized by the Rontgen rays. The picture presented differed so widely from the conception obtained by inflation and percussion that radiologists were in doubt at first which to accept as representing the truth.

It had been assumed that the detection by percussion of the greater curvature below the umbilicus was indicative of gastroptosis, gastrectasia or both combined. This state of affairs, in which the body of the stomach lay below the pyloric opening, was supposed to seriously handicap the evacuation of its contents, since it was assumed that they

depended largely on the influence of gravity for their removal. As early as 1896 Duret (180) had suggested an operation for shortening the lengthened stomach to permit it again to empty by gravity. From this year onwards gastropexy became a favourite operation with many continental surgeons, especially Rovsing (532), who attributed all the symptoms of visceroptosis to the stomach's inability to empty. He assumed the chronic state of malnutrition observed in these cases to be due literally to starvation, since the residue constantly present in the stomach prevented an intake sufficient to maintain nutrition.

The radiologist's first observation was that in the vast majority of healthy stomachs the greater curvature extended below the umbilicus, and they had to seek for a fresh definition of gastropexy. Thus Holzknecht (285) in 1906 considered gastropexy to exist when the pylorus was not the lowest point of the stomach. Schlesinger (541-2) regarded lengthening of the gastric wall, drawing down of the cardia and upper pole of stomach, and sinking and rolling up of the pylorus as indicative of its presence. Beclere and Meriel (56), however, pointed out that the stomach never leaves its attachment to the diaphragm, and preferred to speak of a lengthened stomach rather than a ptosed stomach. They distinguished two kinds, one with normal tone and tubular in form, the other atonic, with an expanded

lower pole, and tending to shew delayed motility.

Kaestle (327) regarded a high pylorus with a low greater curvature as the chief indication of gastropstosis. On the other hand Groedel (252-3) assumed the low position of the pylorus to be the most important sign. As late as 1915 Hurst (299) defined complete gastropstosis as follows: "When the stomach is not only abnormally low in the erect position, but the greater curvature reaches below the umbilicus in the horizontal position". At the same time it was observed that the normal adult's stomach takes one of two general forms, the cowhorn and the fish hook. The fish hook was found to be by far the most common form. It resembles a hook or "J", descends more or less vertically from the diaphragm, curves across the spine and ascends to the pylorus which lies above the level of the lowest point of the lesser curvature. The much rarer cowhorn is a relatively small stomach, broadest at the fundus and narrowing progressively to the pylorus, which is its most dependent portion. It occupies an oblique, sometimes almost transverse position and lies well above the umbilicus.

The physiologists, led by Cannon (107), utilized the X-rays to investigate the motor mechanism of the stomach, and they shewed that it empties by a series of definite muscular contractions which render it independent of the action of gravity. Schlesinger

(542), appreciating the importance of muscle integrity, introduced his well-known classification of the stomach according to the state of tone of the muscle, the orthotonic, hypertonic, hypotonic and atonic; the former two being normal, and the latter two pathological variations. Stiller (575), Bartel (47), and others attempted to co-ordinate these confusing findings. They noted that there was an apparent relationship between the body build of the individual and the position, tone, and motility of the stomach. In individuals with slight skeleton, long narrow sunken thorax, steeply falling ribs, wide intercostal spaces, and acute epigastric angle, the stomach tended to be low and vertical with diminished tone and motility. On the other hand, in robust individuals with broad short deep thorax and obtuse epigastric angle, the stomach tended to be cowhorn in shape, small, lying transversely, hypertonic and hypermotile. Stiller (576) also shewed that, not only was a low atonic stomach a common finding in a flat abdomen, but that even the high hypertonic form was equally frequent in individuals with flaccid pendulous abdomens.

Manouvrier (416) and Godin (235) had shewn that the races of Europe could be divided into two extreme types which they called Brachyskele and Macroskele corresponding with the clinical types termed asthenic and apoplectic, or sthenic by Stiller. They also identified an intermediate type,

the metaskеле.

Treves (592) many years previously, from a study of 200 species of animals, had shewn that the length of the intestinal canal depends on food and environment, and suggested dividing the human race into two types, the carnivorous with short intestines, and the herbivorous with long. Bryant (83) in America combining the observations of Treves, Manouvrier, and others, confirmed the existence of these two extreme types and pointed out more than one hundred points in which the carnivorous differed from the herbivorous. Stockard (577-9) preferred to call them the lateral and the linear types and noted that races living along the coast tend to be linear, while those in the interior tended to be lateral. He suggested the linear type was a fast growing, high metabolizing, thin, but not necessarily tall group, while the lateral was slower in maturing, stocky, and rounder in form. Bean (50-3) preferring to call them meso-ontomorphs and hyper-ontomorphs, differentiates them by the following characteristics:

	<u>Meso-ontomorphs</u>	<u>Hyper-ontomorphs</u>
<u>Face</u>	Large, round or square. Large prominent cheek bones. Broad jaws.	Large and narrow; high forehead; pointed chin.
<u>Cranium</u>	Round or boxed, broad and short.	Long and narrow, prominent behind, straight and high in front.
<u>Cephalic</u>	Index 80 and over.	75 and under

	<u>Meso-ontomorphs</u>	<u>Hyper-ontomorphs</u>
<u>Trunk</u>	Broad, short; shoulders sloping.	Long and narrow; shoulders erect.
<u>Extremities</u>	Short, stocky.	Long and slender.
<u>Sitting Height</u>	53.5 cm. or more, (relative to stature)	52.5 cm. or less.
<u>Stature</u>	165 cm. or less.	About 175 cm. or more.
<u>Teeth</u>	Large, sound, retarded in growth. Dental arch broad.	Small, illformed, irregular, crowded and appear early. Arch long, high, and narrow.
<u>Lungs</u>	Broad and short.	Long and narrow.
<u>Heart</u>	Large.	Small.
<u>Stomach</u>	Large, transverse.	Small, almost vertical on left side.
<u>Liver</u>	Large, 1500 -2000 gms. Lies transversely.	1000-1500 gms. and lies to right of sagittal plane.
<u>Kidneys</u>	Large.	Small
<u>Small Intestine</u>	20-30 feet long sluggish. Needs food of great bulk and little nourishment. If excessive in quantity, patient becomes plethoric, and then kidney disease develops.	10-20 feet long and active. Needs food readily digestible, concentrated as milk, eggs, and meat.
<u>Susceptible</u>	to diseases of tissues derived from mesoderm, e.g. kidney, heart, joint, muscle, etc.	to diseases of tissues derived from ecto- and endoderm, e.g. skin, alimentary tract and nervous system. Tuberculosis, cancer, pellagra, leprosy and all disease of chronic form that come from deficient nourishment.

	<u>Meso-ontomorphs</u>	<u>Hyper-ontomorphs</u>
<u>Mental</u>	Slow, sure, methodical, practical, painstaking, comprehensive, well-balanced, judicious.	Quick, active, vivacious, imaginative, inventive, unstable, idealistic, executive.
<u>Thyroid type</u>	Intermediate.	High thyroid type.

These observations stimulated radiological research into the position of the hollow viscera in unselected individuals free from all digestive symptoms. Mills (451-3) and Ansell (25) in America were the pioneers in this investigation, but were to a certain extent influenced by the preconceived idea that each individual could be fitted into a definite type. Assuming the existence of these types, Mills from a radiologist's standpoint, classified them as follows:

HYPERSTHENIC

In this type the stomach is cowhorn in shape, lies high and transversely, and shews active peristalsis, emptying in $3-3\frac{1}{2}$ hours. The small intestines lie above the pelvis and the caecum is well up in the right iliac fossa. The flexures are attached high with the transverse colon crossing the abdomen above the umbilicus. The haustra are small and numerous. The descending colon sweeps straight down to the pelvis with a short sigmoid loop. The colonic residue after twenty-four hours, if any, is small.

THE STHENIC shews much the same characteristics with slightly lower position and slightly greater residue.

HYPOSTHENIC

This is characterised by the "J"-shape stomach in an individual with a body-build somewhat below the average. The lesser curvature extends below the interiliac crest. The pylorus is low, usually in the region of the umbilicus, and the fundus is in the left iliac fossa. Peristalsis is not so active and the stomach usually requires 5-6 hours to empty. The small intestine and caecum are both in the pelvis with the transverse colon resting on them.

ASTHENIC

All the characteristics of the hyposthenic are exaggerated. The stomach is dilated and its greater curvature lies in the pelvis. Tone is poor, peristalsis is inactive, and emptying time rarely under 6 hours. The colon tends to be spastic, with a 48-hours residue. In one thousand individuals examined by him, Mills (451) found the following distribution:-

	<u>Males</u>	<u>Females</u>
Hypersthenic	89.4%	10.6%
Sthenic	59.9%	40.1%
Hyposthenic	40.4%	59.6%
Asthenic	20.3%	79.7%

He then examined 2,500 individuals complaining of digestive symptoms and found the distribution of

types as follows:-

Hypersthenic	3.6%
Sthenic	44.7%
Hyposthenic	37.8%
Asthenic	13.9%

These figures shew that the distribution of the types in the group with symptoms is practically the same as in the population at large. This suggests, therefore, that there is no causal relationship between low atonic viscera and the production of symptoms. Mills (452) made a further observation of considerable importance. He noted that the head of the bismuth column reached the various landmarks in the gastrointestinal tract at approximately the same time in all, irrespective of the position of the viscera and the tone of the gut, and in this respect, there was no difference between individuals who had no residue after 24 hours, and those with a residue after 72 hours. Bryant, desirous of checking the generally accepted data concerning the position of the abdominal viscera in the cadaver, carefully examined post mortem 177 males and 113 females. In 48% he found wide departures from the generally assigned normal positions. The widest departures from these positions were found to occur in the ascending colon, ileocaecal valve, caecum, hepatic flexure, and liver, in that order of frequency. Although the stomach and right kidney did not shew such extreme variations, they equally frequently departed from the position

stated to be normal.

The most careful work, and work uninfluenced by any preconceived theories, was that done by Moody, Van Nuys and Chamberlain (461-2). They picked out 600 of the healthiest students they could find at the University of California, of whom 200 were athletes or qualifying in physical culture. None had ever complained of dyspeptic symptoms. In the standing position it was found that the lowest portion of the greater curvature of the stomach dropped below the inter-iliac line, i.e. a line drawn between the highest points on the iliac crests, in 74% of the men and 87% of the women. In 25% of the men and in 46% of the women, it was more than 10 c.m. below. They concluded that the greater curvature of the normal stomach may be found at any point between 7.3 c.m. above and 13.7 cm. below the inter-iliac line. Even the lesser curvature in the antral region was found below the inter-iliac line in 13.1% of the men and 28.8% of the women, and in some cases the pylorus was below the line. In a subsequent paper (462) they continued the investigation with a view to comparing the erect and recumbent positions.

They found the excursion of the stomach, i.e. its difference in position in the recumbent and erect posture, greater in females than in males. That is to say, whereas in the erect position the stomach in women tends to be lower than in men, yet in the recumbent posture it tends to occupy the same position

as in men. The colon, on the other hand, not only lay lower in women than in men, but remained low in the recumbent posture. They found that the pylorus and liver normally have a considerable excursion. As regards the pylorus, it may be anywhere between the upper border of the first lumbar vertebra and 5 cm. below the inter-iliac line. In 69% of both sexes it was below the transpyloric plane, in 5% it was in the pelvic cavity, and in 13% it lay to the left of the sagittal axis. They also concluded that the normal position of the caecum is in the true pelvis.

Moody (460) continued their work at the University College, London. From a study of 100 women and 50 men he found the stomach lay lower in British than in American students, the greater curvature being below the inter-iliac line in 87% men and 96% women. In 44 boys of between 7-14 it was below in 84.2%.

By allowing the individual to take one swallow of the barium meal and marking on the abdomen with a penny the lowest point of the shadow, he was able to map out the position of the greater curvature of the empty stomach. This he found to be below the inter-iliac line in 50% men, 52.3% boys, and 70% women. The distance through which the lowest part of the greater curvature was moved down by the barium meal ($1\frac{1}{2}$ lbs.) varied from a small fraction of an inch to four inches.

He then investigated 50 women and 50 men of ages between 40-81 years and all complaining of digestive symptoms. He found the lowest part of the greater curvature below the inter-iliac line in 82% males and 88% females. From this it follows that low stomach occurs more frequently in healthy young adults than in elderly individuals with dyspeptic symptoms. He came to the following conclusions:-

- (1) Long stomachs, with the lowest part of the greater curvature 6", the lowest part of lesser curvature 3" and pylorus 2" below the inter-iliac line are normal.
- (2) Transverse colons dipping into the true pelvis are normal.
- (3) Caeca with the blind end low in the true pelvis are normal.
- (4) Livers with the lower border 1" or more below the inter-iliac line are normal.
- (5) The ability of the stomach, colon and caecum to function normally is independent of their position.

Faber (195) in Scandinavia, and Campbell and Conybeare (106) in England, came to similar conclusions.

The only constant relationship between build and position these observers could find was that since narrow long thoracic cavities tend to be

associated with narrow short abdominal cavities, a stomach will appear low in such an abdomen.

Hrdlicka (289) has shewn that the average American has a shorter thorax and longer abdomen than the average Britisher, which explains Moody's finding that the stomach is apparently lower in British than in Americans.

Barclay (42) some years ago pointed out that tone is an automatic contraction of the stomach musculature, which compensates and counteracts the effects of gravity by holding up the food in tubular form. The tone is independent both of the position of the stomach and its peristaltic activity. He regarded atony as a "defective physiological action rather than a pathological condition".

This concept seems to have led Hurst (307) to a repudiation of his previously held views on the subject of gastropptosis. In a recent article (307) he comes to the conclusion that the types of stomach commonly diagnosed by radiologists as hypertonic and dropped are quite incorrectly named. Experiments with stomach tubes connected with a manometer and the more recent radiologic investigations have shewn that the tone of the normal stomach adapts itself to the volume of its contents and that the pressure within remains constant. This is shewn by the fact that the upper level of the contents are found just under the diaphragm whether the stomach lies horizontally above the inter-iliac line, or vertically

with the greater curvature in the true pelvis. Yet in the past the horizontal stomach was said to be hypertonic and the vertical one "dropped". Hypertonic is obviously a wrong term since the tone is the same in the two stomachs. Gastropptosis is equally wrong since it should indicate that the stomach has fallen. It is true that in so-called gastropptosis the stomach falls on standing from the position it occupies when lying; but every stomach does this and there is no evidence that it has fallen from a higher position than it once occupied in the erect position. So-called gastropptosis is quite common in people with excellent abdominal muscles who have been always thin; it also occurs, though less frequently, in stout individuals.

On the other hand, the so-called hypertonic stomach may exist in people who have lost weight and whose abdominal muscles have become very weak. Nothing, in fact, will make such a stomach drop materially, just as nothing will make the so-called dropped stomach rise to the level of the average stomachs.

The only satisfactory explanation is to regard the difference between the two types of stomach as due to anatomic^{al} variations from the average normal length. The stomach swings freely between two fixed points. These are where the oesophagus passes through and is fixed to the diaphragm about one inch above the cardia, and the point where the duodenal

bulb joins the descending retroperitoneal portion of the duodenum. If it is short, it assumes the diagonal or almost horizontal position of the so-called hypertonic stomach; if it is long, it assumes a vertical position with a steeply ascending pyloric part giving the appearance of the so-called dropped stomach. The "orthotonic" stomach is simply a stomach of average length.

Hurst goes further and states that a "hypotonic stomach" corresponding with the "atonic dilatation of the stomach" of pre-radiologic days does exist. In most cases it has quite a different form from what is commonly described. It is rare and never of any clinical significance, being found incidentally in routine radiologic examination when it reveals itself by the upper level of the gastric contents being lower than usual without any corresponding excess of gas being present in the fundus.

He agrees with Barclay that tone is completely independent of peristalsis, and that atony does not result in any delay in evacuation or give rise to symptoms, except as a complication of pyloric obstruction of organic origin.

It is now agreed that there is no relation between the strength of the abdominal muscles, amount of subperitoneal fat, and the position of the stomach. Chamberlain (461) observed an athlete who trained himself until he could sit up from the reclining

position 300 times in succession without resting, and failed to find any upward move of the greater curvature of the stomach result from this abdominal muscle development. Independently Mills, Carman, Campbell, and Conybeare came to similar conclusions.

Finally Mackeith, Spurrell, and Warner (409) have recently reported the case of a boy of 15 with a congenital deficiency of the anterior abdominal muscles, in whom they found the stomach normal in tone, if anything rather higher than normal, and with no greater excursion. We now know that there is a negative pressure within the abdomen as can be observed from the rush of air on every occasion when the abdomen is opened with the patient in the Trendelenburgh position. The state of affairs within the abdomen is much like that of a hot water bottle which has some water but no air in it. When this bottle is hung up by its neck the water remains a vertical column which reaches up to the plug. However, as soon as some air is let in the water falls to the bottom of the bag.

The condition of the pelvic floor is probably more important than the abdominal wall in deciding whether the column of viscera floating on the top of one another is a long or short one, but probably neither have any influence on the exact relationship of the viscera to each other. Recent work by Wagoner (608) shews that any permanent increase in

the intra abdominal pressure, or rather reduction in the normal negative pressure, is fatal to experimental animals, a finding distinctly at variance with the widely held belief that beneficial results from treatment in cases of visceroptosis is due to a raising of this pressure. For instance, in a comparatively recent review of gastropotosis by Seale Harris and Chapman (264), these writers, after discarding most of the previously held theories on the subject, still hold that the solution of the problem of gastropotosis is not to treat the stomach or try and alter its position, but to increase the intra abdominal pressure.

Conran (141), however, may be regarded as having given the coup de grace to gastropotosis on the clinical side. He found that a low stomach may be unaccompanied by any symptoms which could reasonably be attributed to it. Where symptoms are complained of, they vary greatly and are not in accordance with the physical signs discovered.

In conclusion, reference must be made to a condition which has been the centre of much interest and of no little controversy during the six years which have elapsed since Kellog (346) and Wilkie (632-3) first described it under the heading of chronic duodenal ileus. By this is meant, the production of vague digestive symptoms from intermittent compression of the third part of the

duodenum at its junction with the fourth part.

Wilkie holds that any factor which allows of an undue drag upon the mesentery may induce it from pressure by the superior mesenteric vessels on the duodenum. He cites as causes: congenital or acquired visceroptosis allowing the small intestines to sink into the true pelvis, sagging of the proximal colon loss of supporting fat, and defective bodily posture.

We have seen ^{that} there is very little evidence for the belief that in the intact abdomen the viscera ever drag on the mesenteries. According to Keith (343) the function of the mesentery is limitation of movement and not support, a function compatible with Alvarez' (20) observation that the viscera "float" in the abdomen. Hurst's (307) view seems more in accordance with the evidence. He holds that symptoms can only occur from the natural drop of the stomach on adopting the erect posture when the peritoneal covering of the descending part of the duodenum is so taut as not to allow the whole duodenum to drop on standing. In most individuals the junction between the duodenal bulb and descending duodenum drops with the rest of the stomach. In exceptional cases it does not, and a kink results which produces more or less severe gastric stasis. The condition is then analagous to the rare cases of nephroptosis in which an aberrant

vessel leads to Dietl's crisis. Apart from that, a low stomach and a low kidney are equally common and equally unimportant, whilst a kinked ureter and a kinked duodenum are about equally rare.

(II) THEORIES BASED ON SURGICAL OBSERVATION.

In consideration of these, priority must be given to Lane's views on account of the long period over which he has been advocating them, and the widespread influence they have exerted on medical and surgical practice.

As long ago as 1885, Lane (373) observed a band on the under surface of the mesentery at the junction of the iliac and pelvic segments of the colon firmly securing the bowel to the iliac fossa. This band caused a certain degree of angulation and rotation of the gut, and appeared to diminish the lumen sufficiently to offer an obstruction to the passage onwards of its contents. With this observation as a starting point, Lane in the course of years elaborated a theory which, in its present form, may be stated thus.

The gastro~~ic~~-intestinal tract is a drainage system, at certain points of which exist structures to regulate the onflow and prevent the backflow of the intestinal contents. These structures or sphincters are found at the lower end of the oesophagus, at the pylorus, and at the junction of the pelvic colon with the rectum; subsidiary ones occur

in the second part of the duodenum, at the lower end of the ileum, and in the transverse colon. Each of these regulates the rate of flow of the intestinal contents into the segment below and prevents their return into the segment above.

On account of the unnatural diet of civilized man the rectum is not stimulated to empty itself more often than once a day. This produces overloading of the pelvic colon. The erect posture of man allows this overloaded portion of the gut to drop, producing a kink at the junction of the pelvic and iliac segments. This kink delays the passage onwards of the contents of all parts of the gut proximal to it as far back as the stomach itself. One of two things may result from this delayed passage of the intestinal contents according to the vitality and resisting power of the individual. In those with minimum vitality, little attempt is made to oppose the increasing bulk and weight of the intestinal contents, the sphincters cease to function, and the various segments of the gut dilate, elongate, and become tortuous. First the pelvic colon, descending and transverse colon, then the ascending colon and caecum, and finally the small intestine take part in this process. The dropped intestines now drag upon the fixed duodenal - jejunal junction, narrowing and obstructing it, which leads to distension of the first part of the duodenum. This distension in turn produces pyloric spasm, which brings about gastric

stasis, followed by dilatation and dropping of the stomach. In this way complete visceroptosis results. Secondary changes now occur. The mucous membrane of the prolapsed intestine becomes damaged and permits the absorption of poisonous products from the putrefactive process which the delayed intestinal contents undergo. These poisons enfeeble the muscular coat of the bowel still more, leading to greater and greater absorption and ever increasing delay.

On the other hand, in individuals of greater vitality, the new formation of bands and membranes in the mesentery takes place in an attempt to support the loaded sagging gut. Unfortunately these bands contract, and in doing so distort and angulate the bowel, producing in time a well-defined obstruction which leads to symptoms of a local and mechanical character quite different from the general symptoms met with in the visceroptotic.

Some of Lane's followers, while agreeing with him in the main, propose slight variations in the genesis of the condition. Thus Jordan (326) regards artificial feeding in infancy as the chief cause. According to him, artificial food causes the caecal contents to be solid instead of fluid. This gives rise to sacculations which cause the caecum to lose some of its propulsive efficiency. The caecum now dilates, and in so doing produces a spasm of the

ileocaecal valve. The terminal coil of the ileum hypertrophies to overcome this spasm, then dilates, and the now over-distended loop drops into the pelvis, thus initiating the ptotic process.

While Lane was elaborating his theory in England, the orthopaedic surgeons in America, led by Martin (419), Smith (565-6) and Goldthwait (236-8) evolved a totally different concept.

Impressed by the anthropological grouping of individuals into types, the school of Goldthwait, as it may be called, postulated the existence of a certain body-build which alone could be called normal, and regarded the different types of the anthropologists as pathological deviations from it. Classifying the build of individuals into normal, broad back, narrow back, and mixed, Goldthwait identified his narrow back with the enteroptotic habitus of Stiller. In this type, on account of the narrow thorax, the expansion of the lungs is poor, and the aeration deficient, causing stagnation in the pulmonary circulation which is accentuated in turn by the small cramped heart found in association with it. As a result, the blood pressure is low and the blood poorly oxygenated. In an effort to correct this state of affairs, the right side of the heart hypertrophies and causes distension in the pulmonary vessels which now press on the lymphatics. This pressure on the lymphatics is said in some way to favour invasion of the lung by the tubercle bacillus.

Owing to the narrow upper abdomen all the abdominal viscera lie low; since the lowest part of the stomach is lower than the pylorus the stomach contents cannot easily empty and gastric stasis results.

The intestines, being loosely attached, are readily kinked and, being shorter than usual, are not efficient assimilative organs. Kinking of the intestine, besides delaying the onward passage of the contents, produces a drag on the solar plexus, so that a double effect is produced. That is to say, symptoms of autointoxication arise from stasis, and those of neurasthenia result from the drag on the solar plexus. The basic assumption of this school is that the abdominal viscera depend for their support upon a correct posture whose action is explained as follows:-

When an individual holds himself correctly the diaphragm is high and the abdominal wall flat, so that the stomach is tucked well up into the arch of the diaphragm and kept there through the vacuum created by its high dome formation; at the level of the last lumbar vertebra the antero-posterior diameter of the abdominal cavity is only about a third of the maximum antero-posterior diameter of the body, so that the small intestines are largely held up in the upper part of the abdomen by the shelf thus formed. These in turn give support to the transverse colon and the stomach. The axis of the abdominal cavity inclines upwards and backwards to such a

degree that the kidneys and spleen have definite support from the posterior abdominal wall. Any posture which alters the body axis removes this support from the kidneys and spleen, and abolishes the shelf on which the small intestines partially rest. Then, by the action of gravity, the abdominal viscera descend "en masse" into the lower abdomen.

According to Moore and Wheatley (463) if the child is trained to maintain a correct posture from early life, wears no constricting garment round the lower thorax, nor excessively heavy ones from the shoulders, visceroptosis would not and could not develop.

Strauch (584) and Knapps (355) in Germany, Dagna (156) and Arlotta (26) in Italy, and Cochrane (132) in Scotland, are attempting to spread this purely mechanical conception of disease beyond its native Boston. It has few, if any, adherents among English orthopaedic surgeons who find this simple mechanical interpretation quite inconsistent with clinical observation. They prefer to regard posture and symptoms, not as cause and effect, but as expressions of a common underlying cause.

This view is well expressed by Bankart (34) who says: "postural deformity originates as a functional nervous disorder and the cause is to be sought in the mental rather than the physical condition of the patient. There is frequent association of postural

deformity with neurasthenia and with a neuropathic family history".

While Lane and Goldthwait were seeking an explanation which would cover all the diverse phenomena of this condition, other surgeons were so obsessed by the apparent local nature of the symptoms that they felt a strictly localised pathology must account for all the other symptoms, no matter how general and remote.

CHRONIC APPENDICITIS

As far back as 1896 Rutherford Morison (466) had suggested a chronic inflammation of the appendix as the cause of indefinite long standing, right sided abdominal pain for which Ewald (194) coined the term appendicitis "larvata". The success of Beclere (55) in visualising the appendix by X-ray, and of Grigoryeff (250) in showing that the appendix can only be seen if the lumen is sufficiently patent to admit the opaque material, stimulated greatly the investigation of chronic appendicitis by radiologists as well as surgeons.

Graham and Guthrie (242) in America, Paterson (490) and Fenwick (197) in England became its foremost exponents as a cause of vague dyspeptic and abdominal symptoms of long duration.

In 1910 Moynihan (172) coined the term appendix dyspepsia to denote this type of case, and three years later (473) went so far as to say that "in the



majority of cases where the symptoms would justify or compel a diagnosis of gastric ulcer, the patient is really suffering from a lesion, more often than not, in the appendix".

By now the wave of appendectomy was at its height, and when the appendix removed appeared normal to the naked eye, surgeons found confirmation of their diagnosis in certain microscopic changes which seemed to be departures from the assumed normal appearance. Aschoff (28) initiated the pathologists protest against regarding many of these changes as pathological, by pointing out that the natural obliterative process, which all appendices undergo after ten years of age like lymphoid tissue elsewhere, had been mistaken for a pathological one.

On the clinical side Dieulafoy (166) in France had already insisted upon the fallacy of attributing every obscure pain in the right iliac fossa to the appendix. Later, Hawkins (267) shewed that simple calceal spasm might mimic chronic appendicitis. Among the surgeons Morris (469) was one of the first to admit that the removal of the appendix failed to cure symptoms when its pathology was of the types he called irritans and syncongestive, the two commonly met with in neurasthenic and enteroptotic individuals.

Williams and Slater (634) confirmed Aschoff's findings, and Liek (403) found that only 100 out of 1,000 appendices removed shewed signs of true chronic inflammation. Gibson (222-3) reported, that of 446

cases operated upon for chronic appendicitis 103 were quite unrelieved, and 65 only partially so. Lichty (401) in 517 consecutive cases found 243 quite unrelieved. Yet the majority of surgeons were still unconvinced and pointed to Rosenow's (430-1) work on the specificity of streptococci from teeth, tonsils, and appendix in support of their views.

Even physicians like Hurst (303) claimed that they had seen ileal stasis, hour-glass contraction of the stomach, etc., produced by pressure over the so-called chronically inflamed appendix. In explaining the failure of appendectomy to remove symptoms, they recalled Rosenow's teaching that removal of the appendix alone was not sufficient since it had become infected from a primary focus in the teeth and tonsils, which also required removal for a complete cure.

De Martel and Antoine (417) analysed a series of 124 cases clinically diagnosed as chronic appendicitis, and found at operation that only 34 appeared to have a lesion in the appendix itself. The others shewed the following conditions: in 17 cases, undue mobility of the whole caeco-colon; in 14 a fixed low caecum; in 10 a fixed high caecum; in another 10 the hepatic flexure in a state of "canons de fusil". The remaining 39 shewed a diversity of appearances such as mobile caecum, Jackson's membrane, Lane's kink, simple cecalgia, simple

spasm, etc.

Cabot (100) in analysing the case records of 15,000 cases in which dyspeptic symptoms had been the chief complaint, found that although in no less than 12,600 were they attributable to lesions outside the stomach itself, in none were they due to chronic appendicitis.

Blackford (65), in an analysis of 1,000 cases with digestive symptoms and abdominal pain, reported that in 25% no recognisable lesion was detected and a further 6% could not be classified. He found that of 130 cases who had the appendix removed, 70 were no better than before the operation. In a second series of 1,000 cases 202 had previous laparotomies with 131 appendectomies. Of the appendectomy cases 85 were unrelieved. He concludes that the appendix is held accountable for stomach disturbances far more frequently than operative results justify.

Whiteford's (629) contention that the diagnosis of chronic inflammation of the appendix as a condition requiring operation should be abandoned, is supported by the experience of Deaver (162), Bettman (61), Eastman (182), Held (273) and other surgeons. The most recent attempt to explain the pathology of these cases is that of Holder and Menninger (283) who claim to find in 98% of the microscopically normal appendices some mechanical abnormality, congenital or acquired, which by interference with the blood supply, produces symptoms. However,

Orndoff (486), who has examined the appendix radiologically by a new technique, finds that unless the appendix is fixed along its entire length it is not mechanically the cause of symptoms, no matter what its position, shape, or structure may be.

It is not denied that a true "chronic" appendicitis does exist, but its symptomatology is quite different from the condition here discussed. Recurrent attacks of acute or subacute appendicitis with latent symptomless intervals between should alone be referred to as chronic appendicitis.

This view is supported by Carnett in an article which appeared in The Am. J. M.Sc. 1927, Ch. XXIV., 579. He says: "I have been unable to find a symptom complex which warrants a preoperative diagnosis of (clinical, not microscopic) chronic appendicitis and which will be relieved by appendectomy.

I am firmly convinced: (1) that "chronic appendicitis" as ordinarily encountered under the microscope does not give clinical symptoms; (2) that the clinical symptoms that heretofore have been ascribed to "chronic appendicitis" are not caused by the appendix, and are not physically cured by appendectomy. Psychic or fallacious cures are very common".

MEMBRANES, BANDS, ETC.

Jackson (319-320) had observed in several cases complaining of right iliac pain, constipation, mucous

colitis, and neurasthenia, that although the appendix was normal there was an abnormality present in its vicinity in the shape of a membrane. This membrane consisted of a transparent vascularized veil passing from the right parietal wall to invest the caecum and ascending colon. In it ran bright blood vessels parallel to the long axis of the colon, which was freely mobile, but had the appearance as if it were imprisoned in a bag of membrane much too small to hold it.

Payr (492) had noted that the last part of the transverse colon may be attached to the first part of the descending colon in the neighbourhood of the splenic flexure in a somewhat similar manner. In none of the cases, however, in which it was observed were any definite symptoms attributable to it, and therefore Payr's membrane has received little attention from clinicians.

Not so with Jackson's membrane which was at once associated with the production of the vague right iliac pain and general symptoms said to have been due to chronic appendicitis. Binnie (64), Hofmeister (282), Gerster (221), Pilcher (498) and others who agreed that it was the cause of these vague abdominal symptoms thought it to be of inflammatory origin. Dobson and Jamieson (167) shewed this could not be correct since the path of infection would be by way of the lymphatics, and these run inwards from the bowel

to the meso-colic vessels, away from the situation of Jackson's membrane. Mayo (429) suggested it was of congenital origin, resulting from the caecum and lower end of the ileum burrowing behind the posterior parietal peritoneum during their descent from under the liver. According to Morley (467) it is in some cases the continuation of the great omentum. The now generally accepted view is that it is a developmental anomaly. When the caecum is still below the liver the omentum grows down over the front of the transverse colon and adheres to it. If by chance the right edge of the great omentum fuses with the lateral peritoneum before the caecum descends, the latter organ in descending will stretch out the attachment in the form of the thin membrane described by Jackson.

The early acceptance of this view led to active criticism of Lane's theory, that thickening of the left or under layer of the mesentery, 2" from the ileo-caecal junction, was a new formation on the part of nature to hold up a caecum and terminal ileum weighed down by the excessive bulk of their contents which resulted from stasis. Certain supporters of Lane's general theory could not agree with him in his view that these bands "by crystallization of the lines of force" develop as supporting structures to suspend an overloaded gut. Many followed Chapple (121) who held that they were the result of a local peritonitis induced by the intestinal stasis. Later

work disproved both these views by finding the bands and membranes in individuals free from all the symptoms hitherto attributed to them.

Eastman (180) and Flint (207) in America, also Gray and Anderson (245) in this country, found the band producing Lane's kink to be present in at least 10% of all cases coming to lapar^oatomy, and in none of which were characteristic symptoms found in association with it. Pringle (504) demonstrated its presence in 20% of infants and embryos. Finally, Reid (511) shewed that Lane's band is merely the persistence of the embryonic genito-mesenteric fold, which passes from the terminal ileum to be attached to the posterior abdominal wall along the line of the right spermatic or ovarian vessels. According to Todd (590) there are to be found in many subjects accessory peritoneal bands which cannot be regarded as pathological. Of these, the three most consistently found are the phrenico-colic, the hepaticocolic, and Toldt's ligament or membrane. Toldt's membrane consists of a dense white band situated on the outer side of the loop formed by the pelvic colon, and superimposed on its mesocolon through which it binds down this loop of colon to the iliac fossa.

If it is incised, the mesocolon is found to be in a normal condition beneath it. This membrane is of considerable interest since Lane holds it to be the first formed in the course of events he has

described. He has referred to it as producing "the first and last kink". Its extreme frequency in the embryo and young child, however, shews clearly that it is of congenital origin. A fourth band may be referred to in passing, the cysticolic, which is present in one subject out of every four, and which connects the transverse colon and duodenum with the gall bladder. This cysticolic band is supposed to be due to the fusion of the right edge of the great omentum with the lateral peritoneum after the caecum has descended. Bryant (87-8), who made exhaustive search in cadavers, found developmental adhesions very common in all sorts of situations. He found them in no less than 91% of all bodies examined and in as many as 55 different positions. These developmental adhesions he found remain constant up to about 40, but after that age the peritoneum seems to take on an increased capacity for fusing and a sudden increase of 50% then occurs. This possibility was suggested by Keith (343) when he pointed out that the cells which line the peritoneum have in themselves, as an inherent quality, the power to form adhesions at any period in the individual's life-time similar to what they have done in the past during man's evolutionary history.

The acceptances of these membranes, bands, etc., as congenital structures at once raises the question: Do they, or do they not, cause obstruction? Anatomists, clinicians, and radiologists like Keith (340), Hurst (301), Barclay (40), Mixter (456)

Schwarz (545) and Carman (110) and many others are unanimous in stating that they have never found them obstruct the onward passage of the intestinal contents in the slightest degree.

MOBILE CAECUM

In 1904 Haussman (266) reported eight cases of right iliac pain with constipation in which he could find no pathological changes in the appendix, but did find an abnormal mobility of the caecum and ascending colon. This undue mobility he assumed to be the cause of the symptoms. Albu (6) and Wilms (635-6) reported similar cases and the latter devised an operation for fixing the caecum. On the continent "caecum mobile" was readily accepted as a clinical entity, until Klose (353-4) reported that of 12 cases with identical symptoms, all supposed to be pathognomonic of mobile caecum, three shewed the caecum not mobile but fixed down by adhesions.

Sailer (536) in 1912 reviewed all the literature which had appeared up to that time and found the evidence for the existence of this clinical entity "not proven".

It will be remembered that before the fourth month of foetal life the midgut loop, i.e. the gut from the duodenum at the opening of the common bile duct to the splenic flexure is suspended from the midline by a single dorsal mesentery of which the superior mesenteric artery forms the axis. Sometimes between

the fourth and the fifth month this loop undergoes a counter-clockwise rotation round its axis. The caecum, originally a diverticulum on the posterior limb of the loop, swings round three-quarters of a circle until it comes to lie in the right hypochondrium, under the liver. Here it may remain undescended, or occupy any one of a series of positions from there down to the true pelvis. After attaining its final position, the ascending colon and hepatic flexure are generally bound directly to the parietes by a layer of peritoneum without the intervention of a mesocolon, which the caecum, on the other hand, almost invariably possesses.

G.M. Smith (564), who made a careful examination of 982 cadavers, found that in 17 there was no attempt at direct fixation of the ascending colon and that the whole of the proximal colon possessed a mesentery. In 304 others a mesentery was present with, however, some attempt at fixation near the hepatic flexure. In other words a condition favouring caecum mobile is present in no less than one third of all individuals. Nevertheless surgeons like Waugh (617), Morley (468), and Carslaw (111) attribute the production of symptoms to such a state of affairs, holding that an organ which is not fixed is at a mechanical disadvantage compared with a fixed one. Flint (204-5) has pointed out it was early recognised in Leeds, that of two patients with identical symptoms, one might have an unduly mobile

colon, and the other an unduly fixed colon; also, what is still more important, that the fixation of the one, and the freeing of the other, equally failed to remove the symptoms of which the patient complained.

This observation strongly negatives the view that a mobile caecum is in itself necessarily productive of symptoms. Carson (112) probably expresses the considered judgement of the majority of surgeons of to-day when he says that all the abdominal organs should be capable of some degree of movement, and that fixation of the kidney, colon, or stomach is contrary to nature.

We shall see later that the physiological integrity of the colon is quite independent of its position and mobility.

SYNTHETIC THEORIES

Several observers who felt that Lane and Goldthwait theories explained too much, while other recent theories did not explain enough, attempted a synthesis of the viewpoints in each which appealed to them. Thus Coffey (135) in his monograph on gastro-enteroptosis, accepts the Goldthwait view that the viscera are retained by the abdominal wall holding them on the psoas shelf, but differs from him by holding that these factors are only of secondary importance compared with that of complete peritoneal fusion. Where the fusion is complete,

ptosis cannot occur, no matter how the individual may carry himself. Accordingly, he divides all cases of visceroptosis into (a) general, where fusion is completely lacking, (b) right-sided, where the ascending colon alone has failed to fuse, and (c) midline, where the omental bursa has failed to become obliterated and produce a gastro-colic ligament to support the transverse colon. Contrary to the classical view, he regards the flexures as the last parts to drop, and it is because they remain fixed after the remainder has fallen that kinks are produced which lead to intestinal stasis.

On the other hand, where there is total lack of fusion, there may be no symptoms, since there are no fixed points over which the gut may kink. Symptoms, however, may appear in time because bands and membranes develop sooner or later in an attempt to hold up the falling viscera. Kinks may then develop around these. He supports Longyear (404) in recognising the existence of a nephro-colic ligament, and agrees with him that nephroptosis is always secondary to coloptosis, the kidney being dragged out of place by its attachment through this ligament to the prolapsed colon.

Walton (611-2) in a series of papers puts forward the opinion that visceroptosis is a combination of several factors. He accepts the fact that membrane formation and increased mobility are not in themselves causative of the condition. Also an

inherited mental and physical weakness is nothing more than an accessory factor, otherwise the condition would be as common in men as in women. Faulty development of the postural mechanism is for him the fundamental factor. The condition is commoner in women because young girls receive such poor training of their static muscles that a large number grow up with defective postural tone. Walton departs from the Goldthwait theory by recognising that all individuals with this defective tonus do not experience symptoms. The production of these he explains as follows:- When the viscera drop in these individuals, no symptoms develop unless they are unfortunate enough to possess one or more of the already described congenital bands. If they do, then when the viscera drop, the intestines become irregularly kinked and symptoms arise. He sees the difficulty that no hypertrophy of the muscular coat can be demonstrated proximal to the bands, such as would be expected if they were causing a mechanical obstruction. This he overcomes with the suggestion that the bands cause obstruction by inducing areas of localised spasm of the circular coat of the gut. In his most recent contribution he claims that this is brought about by overaction of the sympathetic system from local irritation by the band.

Cawadias (118), accepting the fact that large numbers of healthy individuals have low viscera, suggests that the term visceroptosis should be

applied only to the condition when the dropped viscera originally occupied a high position. This seems a distinction without a difference, since few, if any, individuals possess a record of the position of the viscera before the onset of their symptoms.

Although symptoms as a rule do not appear before puberty, these synthetic views initiated efforts to recognise the condition in early life and link up the vague digestive symptoms of childhood with those of the adult.

Koenig and Mankell (356) suggested that many of the cases of chronic intestinal disorders in children of three months to 15 years of age were due to visceroptosis. Kerly (348-9) reported 60 cases with X-ray findings. Talbot and Brown (585) in a similar series of cases gave a Goldthwait interpretation to them and claimed that by training in posture and carriage, not only were the symptoms removed, but the viscera were restored to their normal position.

De Witt Sherman (555) independently came to the same conclusion, and Mosher (470) claimed that in all children with chronic digestive symptoms the ratio of sternum length to the length of the sterno-pubic line was that characteristic of the enteroptotic habitus. Quite recently LeWald (398) investigating 44 cases of cyclic vomiting reported finding a dilated ptosed stomach in 23 and an elongated ptosed

colon in 35. He suggested that cyclic vomiting should be regarded not as a manifestation of disordered metabolism, but as a symptom of visceroptosis. These views failed to take account of the normal radiologic differences between the child and the adult.

Rogatz (521) confirmed the previous findings of Leven and Barret (396), Flesch and Peteri (203), Trumpp (595), Simmonds (558), and others, that in infancy the stomach lies in a horizontal plane until the child stands and walks. After then it assumes the vertical form in 75%, but may display a wide variety of shapes and positions within the range of normality. He shewed that a stomach of apparently poor muscular tone and contractility could be converted into one of different shape, tone and motility, by altering the diet.

According to De Buys, Henrique and R.R. Smith (565) the stomach does not assume permanently the adult shape until after three years of age. Wright (641) examined 250 normal children of 6-15 years of age, and noted that as the child gets older the stomach tends more and more to assume the "J" shape characteristic of adults. In 42% the greater curvature was above the iliac crests, in 42% below, and 16% at the level of the crest. In none was there any relationship between the child's body-build and the position of the stomach. He noted that a palpable liver and right kidney was a common finding

at all ages. After 11 years of age the stomach in girls tended to lie at a lower level than in boys. He failed to observe any relationship between the position and shape of the stomach or other viscera, and the production of digestive symptoms.

None of the theories so far considered have successfully withstood the test of time, chiefly for the reason that they were based upon anatomical and mechanical conceptions of disease which left out of account physiological reactions. Clinical research is daily stressing more and more the fact that there is no necessary parallelism between change in structure and change in function, and that the essence of disease is essentially a disorder of function.

This is well expressed in the words of Sir Thomas Horder (287): "We are passing through the stage of incrimination on the score of disease, to that of tolerance on the score of variability in individuals, and we may yet arrive at the stage of indifference, on the score of a changed conception of the standard of health. There are variations, of great physiological significance, in the same individual at different times, and under different conditions.

The adverse criticisms directed towards these theories and the alternative views proposed, require a brief review before considering the more recent purely physiological conceptions.

A CRITICISM OF THE MECHANICAL THEORIES OF
VISCEROPTOSIS

We have seen that long before Lane, the idea had originated that intestinal angulations produce delay in the progress of food material through the alimentary tract, and that a stasis results which leads to the absorption of poisons formed within the intestine. However, the lengths to which he developed his ideas and the sweeping nature of his conclusions stimulated intensive investigation of their fundamental assumptions. This critical investigation revealed many untenable positions and laid the foundation of a physiological interpretation of visceroptosis on a functional basis.

Lane (379) defined stasis as: "such a delay of the contents of the intestines in some portions of the gastro-intestinal tract, but more particularly in the large bowel, as allows the absorption into the circulation of a larger quantity of toxic material than can be dealt with effectually. This delay results from a mechanical alteration in the normal arrangement of the drainage apparatus".

Einhorn (185) in America, where Lane's views were early accepted, produced evidence to controvert the assumption that the digestive canal is merely a drainage tube, and was supported by Bassler (45) who reported 167 cases with Lane's kinks, in only five of

which was constipation or symptoms of stasis present.

However, Jordan (325), who enthusiastically supported Lane, claimed that the following radiological signs were absolutely diagnostic of intestinal stasis, irrespective of the presence or absence of symptoms:-

- (1) Dilatation and writhing peristalsis of the duodenum.
- (2) Ileal stasis with delay of the intestinal contents in the terminal ileal coils.
- (3) Kinks evidenced by localized narrowing, fixation, tenderness and dilatation proximal to the stenosis, and delay in the passage of the intestinal contents.
- (4) New formed bands about the appendix, kinking and fixing it.
- (5) Elongation dilatation, and looping of the pelvic colon.

Without waiting for a decisive answer to the question whether these radiological appearances were normal or abnormal, surgeons seized upon the idea of ileal stasis as a pathological phenomenon, since apparent delay at the lower end of the ileum was frequently such a striking feature on screening the abdomen. We have seen in the previous section that Lane's views of band formation were not readily accepted by the majority of surgeons who sought for some other explanation of this ileal delay. Thus adhesions following acute appendicitis or the presence

of chronic appendicitis was regarded as the cause by Hurst (294-5), George and Gerber (219-20), while Case (114-6) and Kellog (344-5) suggested an incompetence of the ileocaecal valve, and Cole (137) supposed it to follow upon constipation in the proximal colon.

This idea of ileal stasis and ileal regurgitation was no new thing in medicine. Posthius (500) in 1566 described the valve, and Varole (599) in 1570 suggested its function was to prevent the regurgitation of faeces into the small intestine. In 1586 Piccolomini (497) produced experimentally actual incompetence of the ileocaecal valve.

Interest in the structure remained dormant until 1822, when Good (239) shewed that the active muscular sphincteric function of the mechanism at the distal end of the ileum is to moderate the flow of the contents of the small intestine into the colon. In 1897 incompetence of the valve was suggested as a clinical entity by Hertz (278), but it was not until 1914 that its existence was actually demonstrated in the living subject by Cole (138) and Case (114).

Hurst (296) was the first to shew that chyme reaches the end of the ileum one hour or longer before any appreciable quantity passes into the caecum, and that the ileum is often still full 4 to 5 or more hours after the last traces of the opaque meal have left the stomach. During this period of ileal digestion active segmentation but no

peristalsis is to be observed. He asserted that intestinal stasis does not lead to duodenal kinking, dilatation, or ulceration, and points to the fact, since well established, that duodenal ulcers are associated with an unusually rapid passage of chyme out of the stomach and through the whole of the small intestine, rather than with delay. He also says that when the stomach empties rapidly the duodenum contains more barium at a given moment than it usually would do. Hence it appears dilated, and the normal peristalsis and segmentation are rendered more clearly visible, thus accounting for the so-called "writhing". Segmentation in the terminal ileum is very active, and this, Hurst thinks, may be mistaken for an organic narrowing. As to incompetency of the ileocaecal valve, he feels that the valve does not normally prevent regurgitation into the ileum as he has seen this occur with a pressure as low as one foot of water.

Barclay (40) protesting against the conception of "water-tight" compartments with anatomical boundaries in the alimentary canal, holds that food passes into the caecum by pressure from behind and that the ileocaecal valve, not only prevents regurgitation, but regulates the flow into the caecum. That is to say, ileal stasis, up to a point, is physiological. He finds that the time in which food reaches and leaves the terminal ileum depends on rate of emptying

of the stomach. In duodenal irritation, food may reach it in a few minutes, whereas in delayed emptying of the stomach an indefinite time may elapse. Moreover, an accumulation of faeces in the caecum will give rise to back pressure and produce a temporary ileal stasis which is immediately removed by an enema or purge. He also pointed out that the terminal 4" of the ileum gives a shadow quite different from the rest of the small intestine, probably because the circular fibres there are more evenly developed and their tonic action more persistent. He agreed with Hurst that the taking of food into the stomach tends to make the ileum empty into the caecum, and that conversely, where there is true obstruction from old inflammatory changes in ileocaecal region, there is delayed emptying of the stomach. In no case examined did he find any evidence that Lane's kink increased the emptying time of the stomach.

Notwithstanding these observations, Kellog (344), imbued with the idea that the essential factor in intestinal stasis was an insufficiency of the ileocaecal valve, devised operative procedures to render it competent. Case (117) with further experience revised his previous views on ileocaecal incompetence, and along with Baetzer (29-30) and others shewed that the so-called incompetence to enemata was a normal phenomenon. Jones (324), on the clinical side, undertook an exhaustive study of

a series of cases in which the X-ray picture of ileocaecal regurgitation was a prominent feature. He found in his group of 315 females and 185 males that a strikingly high percentage of them were of asthenic build and shewed undue colonic mobility. Only 70% however complained of symptoms, but the relief of the regurgitation did not remove these. On the other hand, some of the most pronounced and persistent cases of regurgitation had no symptoms. Renaudeau (512) in France conclusively demonstrated that ileal stasis is best regarded as a transient or recurrent phenomenon, depending on the state of irritability of the colon more than on any other single factor. He holds that it is of physiological, rather than pathological, significance. He also shewed that in cases of out and out mechanical obstruction in the ileocaecal region, ileal stasis may be conspicuous by its absence.

Kantor (331) has recently revised the whole concept of ileal stasis. He points out that the determination of the normal ileal emptying time is difficult since it represents the sum of two variables, namely the emptying of the stomach, plus the emptying time of the entire small intestine. He finds that incompetence of the ileocaecal valve to enemata is no indication of stasis since it occurs in the same percentage in individuals without symptoms, as it does in those with symptoms, that is approximately 44% of all persons examined. Taking

four hours as an arbitrary normal emptying time, Kantor found delay in 100 out of 161 so-called "stasis" cases. This series comprised an equal number of males and females with an age incidence of 31-40 years. He found no relationship to habitus, but did find contrary to all previous observers, that ileal stasis was much commoner in individuals with a high caecum and short, fixed colon, than in those with a low caecum and mobile colon. In 63% of his cases the appendix had been removed. Constipation was only complained of in 45% of individuals shewing ileal stasis, whereas it occurs in nearly 60% of all cases with dyspeptic symptoms. In every case the filling of the colon was well advanced by the 6-9 hour, and no signs of kinks or adhesions could be detected. In a later paper he confirms Renaudeau's view that it is a recurrent transient phenomenon and finds that the commonest cause of it persisting is an unrecognised colitis.

He holds that some colons are so weak constitutionally that even an ordinary mixed diet irritates them. This irritation is sufficient to cause a functional disturbance which manifests itself by so-called stasis symptoms.

Carman (110) reported that between 1913 and 1917 hundreds of cases of intestinal stasis were examined at the Mayo Clinic and that no obstructive kinks were found on radiological examination, nor were any discovered by the surgeon in those cases which were

explored. Angulations of the bowel were noted repeatedly and in certain planes of view these sometimes seemed to be acute and potentially obstructive, but when observed from another direction the course of the bowel was seen to be curved instead of angular and no stenosis existed.

Rowden, who examined all the cases X-rayed at the Leeds General Infirmary between 1911 and 1922, in a verbal communication informs me that he agrees with Carman and that he has never seen the duodenal writhing of Jordan.

On the question of duodenal stasis Wingate Todd (591) recently wrote as follows:- "While it is not the intention of the writer to deny duodenal stasis with its serious consequences, we do want to point out most emphatically that pseudostasis is not uncommon in the normal healthy subject. We have met with it in students who are in perfect condition. Sometimes it is quite temporary, lasting only a short while, sometimes it is present throughout the hour. Many students can produce temporary stasis by voluntarily contracting the abdominal wall and raising the viscera. When the effort is relaxed the stasis ceases. When a stasis of longer duration occurs it is due to a temporary constriction of the duodenum, not by the weight of the small intestine pulling on the mesentery, but by gas, usually in the transverse colon, causing an indirect pressure on the duodenum. This itself is one result of subconscious nervousness"

True duodenal stasis when it does occur is,

according to Bloom and Arens (68), a radiologic sign seen in various definite pathological conditions of which the commonest are: cholecystitis, gall stones, and duodenal ulcer.

Finally there is the question of the elongated, dilated, looped pelvic colon. Treves (592) long ago pointed out that anomalies in the length of the colon is a common finding in healthy individuals. Bryant (89) found that the human intestine may vary in length to an extent of 100% from the average, and confirms Viator's (603) observation that these variations are present before the 5th month of foetal life. He finds that after birth the colon continues to grow throughout life.

Miloslavisch (455) has shewn that the more extreme variations in the length of the intestine is a racial characteristic. Larimore (390) agrees with Bryant that when the length of the colon exceeds the body length of the individual it must throw itself into loops to accom^wmodate itself to the abdomen.

He examined 502 healthy adults and found the following percentage of variations: redundancy of the ascending colon in .02%, and of the hepatic flexure in 2.8%; an absence of the hepatic flexure in 2.1%; redundancy of the transverse colon in 3%, of the splenic flexure in 3%, of the descending colon in 1.4%, and of the sigmoid in 18%. He found no relationship to body habitus, but did find that in individuals with a distal redundancy motor delay was

twice as common as in redundancy elsewhere and twice again as common in females as in males. On the other hand, in patients with symptoms Kantor (330) found redundant colon present in only 62 out of 1,229 cases, and believes that two-thirds of all individuals who possess redundancy never have any symptoms associated with it. He also finds that of the patients with symptoms the majority are males or females of sthenic habitus. Both Kantor and Larimore consider the so-called low caecum is simply an elongated ascending colon and not a ptosed caecum, since it is only found in 37% of individuals with low stomachs and low transverse colons.

Bryant had pointed out that the physiological constipation of advancing years appears to be associated with the length of the colon increasing with age and in this view was confirmed by Larimore and Kantor. Harvey (265) and Davis (159) were of the opinion that three-quarters of the cases of elongated caeco-colons had no mesentery, but Kantor found that a mesentery was present in half of his cases.

While these observations were gradually demolishing the time-honoured conceptions of a mechanical obstruction delaying the faecal passage, the combined attack of the physiologist and the radiologist on normal gastro-intestinal function were eliciting many new facts which served as a starting point for the newer, or physiological theories of

visceroptosis and intestinal stasis.

PHYSIOLOGICAL THEORIES OF VISCEROPTOSIS

Before dealing with these in detail it is desirable to review briefly our present knowledge of the motor functions of the gastro-intestinal tract.

Starting with the stomach, the earlier workers held that a typical gastric movement consisted of two distinct phases: (a) a peristaltic wave which involved the body of the stomach and preantral region, partitioning the stomach at the incisura angularis. (b) a contraction of the musculature of the pyloric antrum as a whole.

Cannon (107) then attempted to shew that this was not correct. What actually happens is that a single peristaltic wave sweeps from its origin on the body of the stomach to the pylorus without partitioning the stomach.

McCrea, McSwiney, Morrison, and Stopford (437) find that both schools are correct, and that not only are the two types of movement to be seen in man, but occasionally a third variety, in which shallow waves pass on over the formed antrum after the formation of the constriction at the incisura. However, in rabbit and man the two-phase movement is the common one. This observation led these workers to conclude that functionally the stomach consists of a proximal, quiescent reservoir which shews only slow alterations in volume, and a distal, active motor region. The reservoir is composed of the fundus and the proximal

portion of the body, i.e. the cardiac region of the stomach.

The distal motor segment consists of the major portion of the body with the pars pylorica. There is no anatomical division between these two parts, but a well marked functional one is produced by the formation of the incisura angularis.

The observation that a stomach with true achylia empties as fast, if not faster, than one with average hydrochloric acid contents caused McClure, Reynolds, and Schwartz (435) to abandon the classical view of the acid control of the pylorus. Alvarez (13-15) shewed that it is probable that the opening and closing of the pylorus depends to a large measure on mechanical factors, i.e. differences in the gradient of tone and irritability between the stomach and duodenum.

Wheelon and Thomas (625) confirmed this, and found that like the rest of the intestine, the acts of opening and closing of the pyloric sphincter are to a great extent dependant^e upon the motility of structures lying on either side. This means that the sphincter acts as a functional link in the chain of forward conduction of material from the stomach. The antrum, pyloric sphincter, and first part of the duodenum each possesses definite rhythmic cycles which bear a constant relationship and shew a dependence on one another so that parts excited cranial travel caudad to excite the lower segments.

These three portions therefore shew progressive motility which occurs in a definite sequence, and which in man normally causes material to leave the stomach and be delivered into portions of the intestine below the first part of the duodenum. Towards the end of digestion the tone of the stomach probably falls below that of the rest of the tract and permits the normal regurgitation of the duodenal contents into the stomach.

When we pass to the small intestine we find that the apparently well-established "law of the intestine" of Bayliss and Starling has not escaped adverse criticism, notably by Alvarez. The law states that: "If cerebral reflexes be excluded, excitation at any point of the gut excites contraction above, inhibition below". Alvarez (15-17) observes that the few men who have written on the subject all report that the demonstration of this reflex is not easy, and that it is often absent, atypical, or reversed. Instead of the classical three forms of movement occurring in the small intestine (a) segmentation, (b) slowly advancing contractions preceded by inhibition, (c) peristaltic rushes, Alvarez brings evidence to shew that there are only two: (a) Segmentation and (b) peristaltic rush.

The investigations of Alvarez shew that the rhythmic intestinal contractions are not of uniform rate, but vary inversely with the distance from the pylorus. For example, the contractions of a segment

of the duodenum proceed at a more rapid rate (17-21 per min.) than do the contractions of an ileal segment (10-12 per min.) under the same experimental conditions. Associated with the variations in frequency are also differences in the amplitude of the contractions of the intestinal muscle. As the contractions become less frequent, their amplitude increases to the extent that the ratio between the amplitude of the contractions of duodenal and ileal segments is as 3 to 20. Tone and irritability diminish progressively from duodenum to ileum. He finds a direct relationship between the frequency of rhythm and the metabolism rate of intestinal muscle, and shews that this direct relationship is in favour of the view that the intestinal contractions are myogenic in origin and not neurogenic. The graded activity of the muscle with regard to rhythm, tonus, and irritability is probably an important factor in the production of peristalsis, and in determining the direction which this movement shall take. The resistance which is usually found springing up ahead of the advancing wave serves the purpose of keeping the bowel from emptying too rapidly.

The striking feature of the colon is the entire absence of movement it presents in contrast to the active small intestine. Only at long intervals may waves occasionally be seen, and most observers are now in agreement that true antiperistaltic waves never have been observed in man.

Barclay (39-40), Mills (453), Alvarez (15), Hurst (305), etc., are of opinion the caeco-colon fills from the pressure of material entering from the ileum. Mills and Soper (454) claim to have noted a certain amount of "puddling" taking place in the caecum.

The ^sconsensus of opinion is that the more solid part of the faecal column occupies the centre of the lumen and is surrounded by the more fluid part. Welch and Plant (620), investigating the activity of the colon by means of balloons, find that it consists of irregularly recurring changes in tonus, usually with super-imposed contractions. These presumably serve to bring the fluid peripheral part of the column into more intimate contact with the mucosa through the formation of haustra. When the bowel was normally full the taking of food by mouth always increased these muscular movements, but when it was empty no change could be detected. Placing of food in the stomach through a fistula had no effect, shewing that this movement is of psychical origin and is not a physiologic reflex from distension of the stomach by food.

This responsiveness of the colon to psychical effects was also noted by Gilbert Scott (548), who found by opaque enemata that its tone varies according to the mental attitude of the patient. The fear of not being able to retain the enema may produce such an increase in tone as to amount to

spasticity. When the individual is reassured, the apparently hypertonic colon may become atonic. The contents of the colon are said to be moved onwards by mass peristalsis and not by the above-mentioned activities. The mechanism of this movement, observed independently by Holzkecht (286), Barclay (39) and Hurst (294), appears to be: (1) relaxation of the tonic action of the muscular coats with disappearance of haustration, (2) a big peristaltic wave, which sweeps the whole contents along into the pelvic colon. This movement takes place once or twice a day, without subjective sensations of any kind, and without producing a call to stool. The wave appears to begin at the hepatic end of the transverse colon and end at the pelvic colon.

However, Wingate Todd (591) by taking successive radiograms of the proximal colon at intervals of two minutes and submitting these to cinematographic treatment was able to observe a slow peristaltic wave. This wave passes over both caecum and ascending colon during filling, with alternate definition and obscuration of the haustra. He never saw antiperistalsis. The same peristaltic wave was seen in the transverse colon. The slow progress of peristalsis modifies but does not obliterate the haustra. The wave progresses at about half the speed of peristalsis in the stomach. He never saw the mass movement described by Barclay, etc., and concludes that the contents are moved along the proximal colon by slow

peristalsis in a precisely similar fashion to the movement already recognised in the stomach and small intestine.

Mayo (430), Soper (567), and others have shewn that the recto-sigmoid portion of the gut has a definite mechanism which retards the faecal current from entering the rectum. As we have seen above, the taking of food increases the tone of the colon if it is full. This increase in tone above a certain point produces a relaxation of the recto-sigmoid sphincter which allows the faeces to enter the rectum and produce the call to stool.

The present state of opinion regarding the innervation of the gastrointestinal tract and its action on the sphincters is somewhat as follows:

The classical view is that the cardiac portion of the stomach is supplied by the parasympathetic system which carries both motor and inhibitory fibres. In the pyloric region the sympathetic supply first becomes evident, and from this point onwards, as far as the ileo-caecal region, there is a combined distribution of sympathetic and parasympathetic elements, the former motor, the latter inhibitory in effect. The large intestine, as far as the lower end of the pelvic colon, is said to be the site of a pure sympathetic supply, motor and inhibitory impulses being carried by the sympathetic fibres. The remaining portion of the large intestine and the rectum combine a sympathetic and a

? ? ? T.N.I.

parasympathetic supply, the former being inhibitory and the latter motor.

These two systems are supposed to be antagonistic and balanced in action. Any disturbance in this balance upsets the function of the gastrointestinal tract and produces symptoms. Many investigators have looked to a disturbance of this autonomic balance as the real cause of symptom production in visceroptosis.

Thus in 1910, Eppinger and Hess (189) picked out from cases of neurasthenia and hysteria with digestive symptoms, a clinical syndrome which they termed vagatonia characterised by constipation, asthenic dyspepsia, hypersecretion, and pyloric spasm in pale-faced, nervous individuals. They held that normally a balance exists between the action of the parasympathetic and the sympathetic nervous systems, and that this balance may be disturbed by the one or the other system predominating. Believing that the sympathetic system was normally activated by adrenalin, they assumed the existence of a hypothetical endocrine called autonomine which, when present in excess in the body, produced the symptoms by over-stimulation of the parasympathetic. They based their diagnosis on the supposed sharply selective action of certain drugs on the autonomic nervous system. Lewandowsky (399) as early as 1913 disproved this selective action, and was confirmed by Barath (36-37), who demonstrated in the case of calcium and adrenalin an amphotropic action.

It is now known that the action of adrenalin is not essential for the functioning of the sympathetic. Hoskins (288) summing up the evidence for and against, finds that adrenalin at most, merely reinforces the effect of normal sympathetic impulses and that the sympathetic system can do of itself everything that can be accomplished by adrenalin. In a more recent contribution he states that the most plausible assumption is that adrenalin consistently and generally exerts a biphasic effect, serving, if present at all, as a sympathetic sedative. Under other conditions its stimulating effect would come into play.

Sharpey-Schaefer (540) in his review of the dual control of tissues states that the neural control is the primary one. The humoral control is in many cases a useful, and even a necessary auxiliary in maintaining an effect initiated by the neural, and thus economising the expenditure of nervous energy.

Pachon (489) and Laignel Lavastine (368) find that numerous experimental facts are contrary to the conception of a neuro-glandular system in which the autonomic nervous system and the endocrine glands are intimately related, and in which the former is controlled by the latter. The action of the autonomic nervous system on internal secretion is simply a part of nervous regulation in general. However, there is a certain amount of evidence that nervous impulses may liberate chemical substances which stimulate the

intestinal musculature. Thus Magnus (414) states that Le Heux working in his laboratory found that stimulation of the vagus liberates cholin in the intestinal wall, and this may act as a regulator or intestinal pacemaker. Be that as it may, the Eppinger and Hess theory in its entirety has never received serious consideration.

On the other hand, many have sought to explain the production of symptoms by over-action of one or other of the systems induced by stimuli other than chemical. Tyrrel Gray (247-8) sought to combine a mechanical theory with a functional theory based upon over-action of the sympathetic. In his earlier paper he held that the various degrees of prolapse represent variations in a gradual transition from the type found in quadrupeds; the final position in man being one of accommodation to the erect posture, altered food requirements, and so forth. Therefore, ptosis and undue mobility are not pathological, but only predispose to symptom production. Symptoms are absent until either the abdominal wall or pelvic floor give way and allow the viscera to drag upon the mesentery. This mesenteric drag produces intestinal inhibition through the autonomic nervous system, resulting in intestinal stasis and overloading of the bowel. This overloading of the bowel increases the drag upon the mesentery and thus a vicious circle is set up.

In a later contribution, he assumes that in a

pure neurosis the effect of the emotion is to cause excessive adrenalin secretion leading to exhaustion of the adrenals. This results in suppression of the pancreatic function which leads to a diminution of the efferent vagus impulses from this gland. In consequence, there will be a diminution in the efferent impulses going to the bowel, leading to defective secretion and peristalsis with consequent stasis. In passing, it may be stated he offers no experimental evidence in support of this theory which in consequence is distinctly unconvincing. When there is no visceroptosis, kinks, or bands present, psychotherapy may relieve this condition of affairs. But not so in the presence of bands and membranes, since the loaded bowel will pull on them and initiate a direct local or a general reflex sympathetic inhibition, so that a secondary vicious circle is established.

Tyrrel Gray appears, therefore, to have abandoned the view that the drag on the mesentery is productive of symptoms. Such a view is untenable considering the fact that in an individual whose abdomen is open under local anaesthesia, the slightest drag on the mesentery will cause agonising pain quite different from the ache complained of by the visceroptotic. Again, if a cadaver, which in life had apparently a total absence of muscular support by the abdominal wall and pelvic floor, be opened in the erect posture, the viscera have to drop

a considerable distance beyond the boundaries of the intact abdomen before a strain on the mesentery can be detected. Finally since loops of intestine ligatured and placed in water float, it is impossible to see how they can drag on the mesentery in the intact abdomen where, in addition, exists a negative intra-abdominal pressure.

Fraser (210) considers that while the exercise of the antagonistic functions between the parasympathetic and sympathetic systems is general, it is exercised especially in those regions where a special arrangement of the muscle fibres exist, namely at the sphincters. He regards the parasympathetic as the older system, since it subserves localized function, while the sympathetic is later developed to subserve a diffuse and widespread reaction. The sympathetic or inhibitory system is not completely developed at birth, hence there may then develop over-action of the parasympathetic system. This lack of balance may appear at any time of life and be responsible for the functional disorders of the gastrointestinal tract.

Langdon Brown (81) is content to say that the motor disturbances of the alimentary tract may be expressed under the heads of irregular and exaggerated contraction, tonic spasm, and atony. He holds that irregular and exaggerated contractions are due to irritation of the parasympathetic system; when this occurs in the vagal area colic results, and when in the pelvic area tenesmus. Tonic spasm and atony are

both due to sympathetic irritation. This irritation expresses itself by excess of normal movements at the sphincters, producing spasm, and by deficiency elsewhere, producing atony.

A quite recent contribution to this subject comes from T. Stacey Wilson (638) in his book on Tonic Hardening of the Colon. According to him, in certain states of the nervous system micro-organismal activity in the colon induces a state of "elastic fixation" of the colon muscles. When this occurs abnormal stimuli radiate from the hardened colon. These, acting through the autonomic system, may produce the most profound disturbances in gastrointestinal function. On the other hand, they may pass direct to the central nervous system and through it cause symptoms in other parts of the body as well as in the psychological sphere. This is "proved" by always finding the pelvic colon contracted in such cases, and by the disappearance of symptoms when the colon relaxes. In view of the fact that the colon may be found contracted at one time and relaxed at another in the same individual, irrespective of the presence or absence of symptoms, it is not likely that "elastic fixation" plays an important part in symptom formations.

The very term autonomic suggests an isolation of this nervous system as a self-contained unit, independent of the central nervous system, which functions as an "abdominal brain". Hence, it is

easy to push our ignorance one step further back and assume a lesion or disorder of this isolated, self-contained, nervous system, as the explanation of functional symptoms in the area of its supply.

Macleod (410) reminds us, however, that, because the neurons of the autonomic system are organised somewhat differently than are the efferent paths to skeletal muscle and innervate organs of different functions, the mistake should not be made in thinking that it functions independently of the central nervous system.

Langley (387-8) conclusively proved that there are no commissural fibres between the different sets of sympathetic ganglia, such as would have to be present if these ganglia were to mediate like an "abdominal brain". Abel's work (1) also supports this view on the embryological side.

The functions of the connector fibres in the autonomic system would appear to consist largely in adjusting the activity of these structures, as a whole, to the conditions of activity brought about in the somatic musculature. Correlation takes place between visceral activity and somatic activity so that the closest co-operation can be obtained between the organs of the body. There are times when the animal needs as a whole to communicate with its gastrointestinal tract or one end of the tract with the other, and for this purpose the autonomic nervous system is utilized.

Cohn (136) suggested the vagi carry feelings of hunger to the brain; Loeb (107) that they carry the impressions which make the animal feel comfortable and sleepy; and Cannon (107) that they help in adjusting the tone of the stomach to the food entering it, and carry the stimuli which give rise to the psychic secretion. If the food is to be rejected they carry the impulses which bring the abdominal muscles into action. He also thinks the splanchnics serve to quieten the tract and stop digestion when the body is distressed or injured.

McDowall (438) says it is clear that a balance between the parasympathetic and sympathetic is not essential to life since the stomach can empty itself when all extrinsic nerves have been served.

McSwiney (438) looks upon the vagus as regulative rather than essentially motor. Alvarez (15) reminds us that the stimulation of the vagus is not uniform in its effects; most often, after a short period of inhibition, there follows a long phase of unusual activity or movement.

Carlson and Litt (109) confirmed previous observers in finding motor and inhibitory fibres enter the pylorus by way both of the vagi and splanchnic nerves. Their experiments shew that states of spasm or atonicity of the pylorus may be caused by excessive activity of either vagus or splanchnic efferents, motor and inhibitory. They find that appropriate stimuli of all visceral sensory nerves induce a

temporary spasm of the pylorus, even when the vagus is severed. They advance the view that the action of the visceral efferents (both sympathetic and parasympathetic), at least on some of the motor mechanisms, are association or reflex responses and not simple peripheral responses like that of the skeletal muscle, or stimulation of the pyramidal tract. That is - the visceral efferents are in reality afferents to a local but diffuse reflex mechanism in the viscera. The prevailing view of a simple antagonistic action of the vagus and sympathetic system is not tenable for the stomach and pylorus at least. Motor or inhibitory effects on these regions of the intestine are produced by both the vagi and splanchnic systems, the character of the peripheral responses depending on the initial physiological state of the peripheral motor mechanism, analogous to the so-called "postural reflexes" of the spinal skeletal system.

In this connection it may be recalled Grey (249) shewed that when the stomach of a living animal is distended by fluid the intragastric pressure shews very little change, even up to the point of rupture of the viscus and that this seemed to be controlled, not by the extrinsic nerves, but by the nervous elements residing in the gastric wall itself. This may be the mechanism which determines the character of the peripheral response described by Carlson and Litt.

Grasset (243) ten years ago pointed out that physiologists had completely abandoned the ancient dichotomy of the nervous system into a cerebro-spinal part (with the brain as the essential organ) for voluntary conscious acts, and an autonomic (with its ganglia) for involuntary, unconscious phenomena. The motor effect of excitation of the cerebral cortex, he adds, does not limit itself to the contraction of the trunk muscles but reacts on those of the intestines, circulation and glandular reservoirs. Ott (105) obtained an inhibitory action on the stomach by stimulation of the optic thalami and cerebral peduncles. Budge and Valentin (105) found intestinal movements amplified by stimulation of the corpora quadregemini, and Bochfontaine (105) obtained movements of the intestines in dogs by stimulation of certain parts of the motor cerebral cortex.

On the peripheral side, King (350) has demonstrated that impulses from the urinary tract, rectum, peritoneum and certain skin areas, reflexly diminish the tonus and movements of the small intestine.

Barber and Stewart (38) had previously shewn that stimulation of appendix, gall bladder, and duodenum reacts on the motor activity of the stomach.

Delay in the development of the inhibitory apparatus as a whole during the early months of life, when rigidity and spasticity predominate until myelization of the pyramidal tract is complete, is a

normal phenomenon. It may be remembered that years ago, Verworn in his "General Physiology" suggested inhibition in general might be due to subminimal stimulation. The necessary training for its development would appear to be adequate stimulation centrally and peripherally. Where this does not occur, or for any reason is impossible, the development of inhibition lags. The success of thick cereal feeding in the pyloric spasm of infants is very suggestive that there may be some truth in this theory.

The conclusion to be drawn from the evidence here offered, is that the gastrointestinal tract, functioning by means of its own inherent mechanism, communicates with the central nervous system through the autonomic nervous system. The double innervation by parasympathetic and sympathetic is, according to Arnau (27), Alvarez (15), and others, a development for the better regulation of the gastrointestinal tract as a whole. The central nervous system makes use of the vagus to produce localized effects, and of the sympathetic to produce widely diffused ones. The network-like arrangement of the long non-medullated fibres of the latter allow a ready diffusion of impulses travelling either way.

In the earlier days of colectomy for intestinal stasis, Keith (340) had the opportunity of examining a series of colons removed by Lane. He was struck by the absence of any pathological finding that

suggested obstruction in the sense of the term used by Lane and his school. Remembering also, that Murphy and Cannon had demonstrated that experimentally produced acute flexures of the bowel do not cause delay in the passage of the intestinal contents, he sought another explanation of intestinal stasis.

Keith (341-2) had found in the ileocaecal junction of the rat certain peculiar branching cells, intermediate between a nerve cell and a muscle element. He had previously observed that true ganglionic cells are immigrant neuroblasts from the neural canal, and that they do not reach the myenteric plexus before the fourth month of intra uterine life. From this he concluded that a myenteric plexus was a composite structure composed of ganglion cells, muscle cells, and a network of intermediate cells, and that it functioned in virtue of these intermediate cells as a pacemaker, as well as a conducting agent.

He found plexuses well developed in the pyloric region of the stomach, on the lesser curvature, in the second part of the duodenum, in the distal part of the transverse colon, in the descending and iliac colon, and highly developed in the rectum. This led him to assume that food in passing along the alimentary tract was propelled through a series of zones or segments, each furnished with its own pacemaker and its own rate of rhythmical contraction. When irregularities or blocks do occur we should

expect to find them at the points where one rhythmic zone passes into another. It was precisely at such points where the Lane school claimed to demonstrate the existence of obstructive bands and kinks. To obtain an orderly propulsion of food these rhythmic zones must be closely co-ordinated in their action. Disturbance in any one segment upsets the rhythm in all the other segments. In other words, each plexus guards its segment in the same way as a signal box protects its particular section on the railway. If there is a delay anywhere, the segment above refuses to pass on its contents until the line is "all clear" below.

Alvarez (11-15) disagrees with Keith. He points out that Magnus (413), Gunn and Underhill (259), and others have shewn that plexus-free intestinal muscle contracts rhythmically, and that digestion proceeds quite satisfactorily after section of the vagi and sympathetics, as soon as the shock of section has passed off. In view of this, and his own work already referred to, he concludes that the myenteric plexus is a fairly simple nerve network without synapses, centres, or reflex arcs, whose principal function is to expedite conduction. He can find no evidence in support of Keith's zones, nor of rhythmic domination of one segment by another. He concludes that gastrointestinal symptoms are motor symptoms produced by either: (a) speeding up, (b) slowing down, (c) complete stoppage, or (d) reversal of the

gradient of tone, irritability, and rhythmicity, which he has demonstrated in the gastrointestinal tract. Toxins, psychic influences, etc., may upset the gradient, increasing, lessening, abolishing or reversing it. Thus the vomiting of enemata, an old clinical observation, can only be explained by complete reversal of the gradient. Kast (335) had demonstrated its presence by giving lycopodium in capsules at night and recovering the spores from the back of the tongue next morning. Rectal constipation, by raising the tone in that segment of the gut, causes a reversed peristalsis; the nausea, biliousness, and furred, coated tongue, result from the passage upwards of colonic contents. Heartburn results from reversed peristalsis carrying normal gastric juice up to the sensitive lower pharynx; globus hystericus from a wave of swallowed air meeting a regurgitant wave. The relief which follows belching occurs when these waves of reversed peristalsis are permitted to run themselves out. He assumes that psychical influences can depress the gradient in one area, and raise it in another. The disturbance in the smoothness of working which results is quite capable of explaining the pains, flatulence, etc., complained of by these patients.

Prior to the introduction of the fractional method of investigating the secretory function of the stomach, many patients in the group here considered were assumed to owe their symptoms to some

disturbance in secretion. The classical researches of Pavlov, Starling, and Cannon elucidated the mechanism of the production of gastric juice. Ivy (315) has shewn it depends on three factors:-

(1) Cephalic stimuli consisting of:-

(a) Reflexes through the cerebral cortex
(psychical)

(b) Reflexes through the thalamus, mid-brain, and medulla, caused by sight, smell, taste, chewing and swallowing.

(2) Gastric stimuli from:-

(a) Mechanical distension of the stomach even after section of the vagus and sympathetics.

(b) Chemical action on the gastric mucosa
(by meat and meat juice).

(3) Intestinal stimuli.

A transplanted stomach was found to recommence secreting gastric juice, 2-6 hours after a meal, suggesting that some substance in the food, or one formed de novo in the intestine after absorption, is responsible for the final phase of secretion.

Prior to the discovery of what constitutes a normal secretory curve, much stress was laid upon hyperchlorhydria and anhychlorhydria as pathological entities existing in the absence of organic disease. Yet Ewald (193) had shewn many years ago that patients cured of their symptoms of hyperchlorhydria shewed the same high acid titre after treatment as

before. Later Hurst (293) conclusively demonstrated that the intact stomach is insensitive to the highest concentration of HCl ever found in the stomach, and that it is only when the gastric secretion regurgitates to reach the sensitive lower pharynx that the patient complains of "acidity" and "burning".

Rehfuss (508-9) and subsequent workers have shewn that just as there are marked variations in the position and contour of the stomach in health, so are there also similar variations in the motor and secretory function. Thus there is a normal "slow" stomach and a normal "fast" stomach: normal hypersecretory, isosecretory and hyposecretory type. Bennett (60) confirmed this, finding that normal stomachs give widely varying curves both from the point of view of emptying time and height of secretion.

Bell (58) sums up the general consensus of opinion by saying there is no longer any justification for the employment of hyperchlorhydria or achlorhydria in a diagnostic sense. Bloomfield (69) using a particularly delicate method and testing at 10-minute intervals, finds the acidity and volume of secretion remarkably constant for each individual, but that motility was extremely variable and did not shew any constant features either as regards emptying time or gastric volume curve. He also found great variations in the gastric tonus on successive examinations. Moreover, a deficient ability to secrete acid was a frequent occurrence in a

miscellaneous group of persons, and no clinical significance could be attached to it.

Bassler (47) examined the secretory curve of 172 cases of visceroptosis and classified it as normal in 51, as shewing hyperchlorhydria in 47, hypochlorhydria in 68, and anhychlorhydria in 6.

Harris and Chapman (264) in 551 cases found 78 shewed free Hcl between 20-30, 56 below 20, 247 above 30, and 23 achylia. These figures are roughly the same proportionate variations to be found in a similar group of healthy individuals. Campbell and Conybeare (106) found high acidity with a high placed hypertonic and rapidly emptying stomach, the most common association. On the other hand, low acidity with a low, hypotonic, slowly-emptying stomach was found less constantly associated.

Keeton (338) experimenting with a Rehfuess tube, found that when it reached the duodenum in a visceroptotic patient nausea was produced, accompanied by dizziness, sensations of pressure in the neck and head, headache, and syncope. He suggests that nausea results from a motor duodenal dysfunction, probably antiperistalsis. The other sensations he regards as evidence of a low threshold of sensibility, which allows stimuli from the duodenum to reach the central nervous system through the autonomic nerves, and there overflow into the vasomotor centre.

Other observers consider that all the symptoms

arise from a disturbance in the vasomotor system and that the alimentary tract is affected only secondarily. Larimore (389) using Mill's classification, studied the blood pressure in relation to types of body habitus in 417 factory workers. He found the sthenic habitus shews a higher blood pressure than the asthenic, while the pressure in the hyposthenic group was intermediate. The average blood pressures were approximately the same for male and female asthenics (males 106/63, females 105/68). Hyposthenics are also approximately the same (males 116/71, females 115/72). The sthenic group shewed somewhat higher pressures for males (males 126/78, females 118/73).

These relations did not change when types were separated into groups of age decades. Robertson (520) thought that the symptoms can be explained by disturbances in the abdominal circulation. Mallory (415) agrees with him, pointing out that there is a relative vasomotor paresis in these individuals, evidenced by a fall in blood pressure and rise in pulse rate when they pass from the recumbent to the erect posture. This determines an engorgement of the abdominal viscera, which increasing in weight drag on the mesentery. This in turn leads to further disturbances of vasomotor control and motor dysfunction, with pocketing of gas in the intestinal loops resulting in sensations of fullness and tension. Mallory thinks that the reason why enemata and

cathartics produce temporary relief is because they deplete the splanchnic circulation.

Fossier (208), on the other hand, regards the elongated narrow ascending aorta, attenuated aortic semi-circle, and the drop heart found in asthenics, the chief cause of their troubles. He attempts to shew, by the principles of mechanics, that blood flowing through a narrow arch and elongated ascending aorta will loose 10-30 mm. of pressure, and the consequent low blood pressure constantly present is the factor productive of symptoms. The mechanical principles he invokes apply, however, only to rigid tubes, and not to living muscular structures like the aorta.

Netschajew (482) claimed to find non-striped muscle fibres in the mesentery and peritoneal ligaments. These are innervated by the sympathetic, and relaxation of their tone allows the viscera to drop. For him it is the mental state of the individual which brings about the low position of the viscera and produces the symptoms and not vice versa.

Hurry and Fenwick (292), on the other hand, return to the pre-radiological theories and regard visceroptosis as a "vicious circle" disease belonging to the group which includes pulmonary tuberculosis, cardiac failure, obesity, neurasthenia, and chronic constipation inter alia!

AUTOINTOXICATION AND CONSTIPATION

"On the periodic functioning of the colon" says Lord Dawson, (161) "depend our health, comfort, mental alertness, and emotional outlook to a greater degree than we care to confess".

Mankind seems to be strongly prejudiced against such an assumption and from the very earliest times preferred a quite different explanation of the mental and physical discomforts so frequently associated with irregular bowel movements. With a remarkable uniformity from one period to another has persisted the belief that absorption of toxic substances must of necessity accompany constipation. There are few pathological conditions which have not at one time or other been attributed to it. Judged by later standards Von Haller (262) erred on the side of moderation when he stated that fever, consumption, haemorrhage, and insanity are the inheritance of constipation.

In 1805 James Hamilton published his "Observations on the utility and administration of Purgative Medecines" in diseases as diverse as typhus fever, marasmus, chorea and haematemesis. Twenty years later, the publication of Esquirol's (191) observations on the intestinal displacements in maniacs gave rise to a school of copro-psychiatry which had its day and passed away until its revival at the beginning of the present century. In this

age of scientific medicine we still find a great number of morbid states attributed to poisons of gastrointestinal origin. These include not only such minor conditions as headache, malaise, lassitude, etc., but also sciatica, tetany, epilepsy, eclampsia, many forms of dermatitis, various forms of nervous disease, myxoedema and cretinism, chlorosis and pernicious anaemia, cirrhoses, nephritis, arteriosclerosis and cancer!

The belief that a displaced intestine worked at a mechanical disadvantage and was inefficient in passing on its contents was not unreasonable in the light of the knowledge available before the birth of radiology. But the persistence of the idea that poisonous substances were formed in the intestine and absorbed into the body from there, despite repeated failure to demonstrate their existence, suggests an emotional rather than a scientific, state of mind. Long before investigators attempted the isolation of this toxic substance, theories were elaborated to explain how and where it was formed. James Jackson (318) over a hundred years ago suggested it originated in the putrefaction of animal food and in the acetous fermentation of vegetable food.

In the middle of the century Senator (552) revived the idea that protein decomposition of any sort might originate the toxin. But it was left to Bouchard (78) in 1887 to beguile thought by the "false imposture and force of words" with the term

autointoxication.

This word has survived, in the phrase of Albutt (8), "to oppress and mislead us, as other ghosts do, when the underlying thing has dissolved". For it is to be remembered that Bouchard regarded the stomach as the site of absorption of the poison, and not the colon. He makes it quite clear that autointoxication results from a congenital weakness of the muscle fibres of the stomach which allows it to dilate. The contents, no longer completely evacuated, stagnate and decompose, and from this decomposing mass are absorbed poisonous substances. On the other hand Mathieu (423) and his co-workers shewed that where there was true obstruction and stagnation, and where putrefying contents could be withdrawn by the stomach tube, as in cancer of the pylorus, there were no symptoms of autointoxication present. Yet in cases of autointoxication the stomach tube failed to reveal any putrefying contents in the stomach.

The word "autointoxication" then became applied to poisoning from the bowel, the result of chronic constipation, and thereupon began the search for the hypothetical toxin and the elucidation of its relationship to numerous general disorders presumed to be caused by it. Weintraud in *Ergeb, allg. Pathol.* (4). 1, 1897, exhaustively reviewed the work done up to that time and found the evidence for the existence of such a toxin non-proven.

With the opening of the present century the

idea, through the work of the surgeons, again came to the front, and received great impetus from Metchnikoff (443-5). This worker with much skill and eloquence attempted to prove that most of the manifestations of senility come from putrefaction in the large bowel, and suggested that the colon was a useless structure which man was better without. Combe (139) proposed a modified Bouchard theory to the effect that a diet too rich in protein in a stomach shewing motor insufficiency tended to ferment. This fermenting material on reaching the intestine produces there a spasm, and this spasm leads to stasis and further decomposition.

To Herter (275) belongs the credit of first investigating the subject on really scientific lines according to the type of pathogenic organism at work in the intestine. He proposed a classification of cases of autointoxication into:- (1) An indolic type, characterised by indicanuria, originating from the putrefaction of protein by members of the *B. coli* group of organisms. (2) A saccharo-butyric type, characterised by the absence of indicanuria, originating from the fermentation of carbohydrates by anaerobes. (3) A mixed type, a combination of (1) and (2). However, the bacteriological evidence he brought forward in support of his views failed to carry conviction.

As more and more of the possible products of gastrointestinal putrefaction became known, isolated,

and experimented with, each in turn failed to produce the symptoms of autointoxication. This failure led Adami (4) to put forward his sub-infection theory that the cause was not a chemical absorption but a bacterial invasion of the body of a special kind. He assumed that intestinal organisms were continually passing through the intestinal mucous membrane in numbers sufficient to pass the barrier of lymphatic glands, but not sufficient to retain a foothold in the tissues of the various organs they eventually reached and where they were destroyed. This continuous destruction led to the tissues wearing out and a true acute or chronic infection supervening.

Satterlee (537-8) appears to be the only supporter of this view. He finds that all the colons he has removed shew signs of infection of the lymphatic vessels and glands in the mesentery. From these he claims to have isolated B.coli and streptococci at operation. He holds that these patients suffer from a toxæmia from the toxins elaborated in these lymphatic glands and that it is only later, when the defensive barrier breaks down, that a true bacteriaemia occurs. Lane's school on the other hand holds the primary condition to be a chemical toxæmia which, by lowering the resistance of the intestinal mucosa, only later permits an invasion of the body by micro-organisms.

Mutch (478), recognising that none of the hitherto isolated putrefactive substances in the bowel had

been proved to be toxic, attempted to solve the problem. Admitting that the large bowel is delegated to the bacterial destruction of food residues, he considered that the flora engaged in this destruction works in relays. The intermediate products which are toxic are seized upon in normal circumstances by successive strains of organisms until the final innocuous bodies are formed. In intestinal stasis this relay race is interfered with so that the final innocuous substance is never reached. Instead, the process stops short at beta-iminazo, a depressor substance derived from histidin. It is the presence of this substance in the blood which produces the symptoms of autointoxication. Mellanby (442), however, found that beta-iminazo could be obtained only with a pure culture of a certain strain and that in the presence of other organisms, as in the bowel, it was rendered inert as rapidly as it was formed. Wells, (621), after an extensive review, finds that few of the known products of gastrointestinal putrefaction are toxic to any considerable degree. Those that might be toxic are probably produced in too small quantities to cause any appreciable effect, especially in view of the detoxicating and eliminating powers of the intestines, liver, kidney, and other organs. Alvarez (16) also shews how inconclusive is all the evidence so far submitted to prove that substances absorbed from the alimentary canal are common or

important sources of intoxication.

Since the publication of Alvarez's paper, Power and Sherwin (503) have produced further evidence against the existence of a putrefactive toxin. They found that 50 mg. of skatol or indol might be ingested daily without producing more than nausea, loss of appetite, headache, melancholia, and sleeplessness. They find that from the chemical standpoint, putrefactive products belong to two classes, those containing nitrogen and those not. The nitrogen containers are formed by the action of certain bacteria which remove CO_2 from the acid group of the protein derivative and belong to the amines. In the non-nitrogen containers, the nitrogen is first removed and the compound which remains is acidic in character, and contains only carbon, hydrogen and oxygen.

They prepared chemically pure samples of all known amines and of the non-nitrogenous products. Although amines are 20-100 times more toxic than the non-nitrogenous compounds, neither produced any of the classical symptoms when ingested by individuals in doses of 1 gm. in 24 hours. The amines produced nausea, loss of appetite, high nervous tension, sleeplessness, feelings of impending evil, and always a severe diarrhoea, with a slight rise in temperature, pulse rate, and blood pressure. The non-nitrogenous products increased appetite, slowed the cerebral functions and produced drowsiness. The difference

in toxicity appeared to depend chiefly on rapidity of absorption and the length of time necessary for detoxication. Their experiments shewed that the human body is equipped with a chemical defence mechanism that is capable of detoxicating the various types of putrefactive products formed within the intestines, and at the same time is able to cope with larger quantities of these products than are normally present within the intestine. They conclude by saying that this chemical defence mechanism is non-specific in character and more than adequate for the detoxication of the small amounts of putrefactive products normally produced in the human intestine by the action of putrefactive bacteria on unabsorbed protein material.

That this defence mechanism is widespread in the body is made clear by numerous experiments. G.H. Whipple, in a series of papers beginning with that on Proteose Intoxication (J.A.M.A. 1916 LXVII 15) shewed that the highly toxic substances formed in an obstructed loop of small intestine are harmless when put into a healthy intestine.

Koessler and Hanke (357) found that 500 mgm. of histamine produced no effects whatever when placed in a dog's intestinal tract, and that less could be recovered than had been put in shewing that some had been destroyed by the intestinal mucosa.

In the case of toxic substances which are absorbed, Richards and Howland (621) confirmed

Herter and Wakeman's (277) work that the liver is capable of conjugating indol and similar substances into harmless compounds.

Finally, that this detoxicating property is not specific for the liver cells was demonstrated by Koessler and Hanke (357) who injected histamine into the portal vein, femoral artery, and femoral vein of dogs. The dose injected into the portal vein and the femoral artery was equally detoxicated, whereas that injected into the femoral vein produced toxic symptoms. This suggests that the detoxicating action resides in the capillary bed and is probably a function of the reticulo-endothelial tissue in general.

Jordan, Kellog, and others held that the symptoms of autointoxication only arise when colonic stasis produces an incompetence of the ileo-caecal valve permitting invasion of the sterile lower ileum by bacteria. Andrews (23) shewed, however, that whereas the duodenal contents in health contain few organisms, yet bacterial multiplication recommences before the terminal ileum is reached. This is not surprising in view of the readiness with which members of the coli group and the more resistant streptococci grow in bile. Macleod (410) states that in the small intestine in man there are present normally bacteria capable of acting on carbohydrates. These produce lactic, acetic, and other acids which inhibit the action of any protein digesting bacteria

present. Probably there are also present bacteria capable of splitting fatty acids into glycerine. In the large intestine cellulose and protein digesting bacteria predominate.

It was on the predominance of one or other of these two groups of bacteria in the stools that Herter and his school based their diagnosis of intestinal intoxication, but this claim was never substantiated for adults. In addition, Porter, Morris and Meyer (499) claimed to be able to identify a putrefactive, a fermentative, and a normal stool by bacteriological examination. Davison and Rosenthal (160), however, shewed that the so-called putrefactive and fermentative stools occur almost as frequently in normal children as do normal stools. They found that the organisms said to be those of putrefaction were harmless saprophytes.

In children with symptoms, a fermentative stool does not indicate that organisms of fermentation are producing the symptoms. All the evidence is in favour of the view that the symptoms are due to the small intestine being unable to absorb carbohydrate, which being passed on to the colon unchanged is there fermented by B. coli group. On the other hand, where there is delayed absorption of protein the same organism putrefy the unabsorbed portion into the amines.

Tissier (589) basing his work on the earlier observations of Senator (553) and Escherich (140) demonstrated that the intestinal flora of infants is

constant in composition according to the food. In breast-fed infants *B bifidus* is the predominating organism, and in the bottle-fed infants *B. acidophilus*, but as soon as the child is taking a mixed diet the intestinal flora assumes the adult type with *B coli* predominating. Metchnikoff hoped that by sour milk feeding the *B coli* might be inhibited by the growth of *B acid lacticus* and the colon thereby purified, but this hope remained unfulfilled.

Herter and Kendal (276) continued Tissier's work and found in adults a definite correlation to exist between specific types of bacteria and the chemical composition of the ingested food. They concluded that the intestinal flora is fundamentally a physiological unit rather than a heterogeneous collection of adventitious micro-organisms. Then Rettger and Cheplin (513-4) introduced the *B. acidophilus* which under experimental conditions succeeded in maintaining a foothold in the intestine but died out in a few days after the resumption of ordinary diet. It was hoped that the administration of lactose would enable the *B. acidophilus* to survive. However, Dragstedt, Cannon and Dragstedt (170) have shewn that any delay in the passage of the intestinal contents results in a proteolytic flora irrespective of the character of the diet. In conditions of delay even such carbohydrates as dextrose and lactose are probably completely absorbed in the upper part of

the intestine, and so cannot reach the colon to liberate there sufficient acid to inhibit proteolytic organisms. Normally they do this because, not being easily absorbed, they reach a part of the intestine where bacterial growth is at a maximum.

Dudgeon (177) in a very valuable article has shewn that spirochaetes, streptococci, long and short chained and haemolytic, haemolytic colon bacilli, staphylococci aureus and albus, diptheroids and anaerobes like B Welchii, may all be isolated from the faeces of healthy individuals. He confirms the work of previous investigators who found that the number of micro-organisms in the intestinal canal depends, in health, largely upon the number introduced by the mouth. He finds that among the normal population who have committed dietetic errors bacteria foreign to the faeces may be found, and also that the common inhabitants, the enterococci and non-haemolytic colon bacilli, may be greatly increased in number. Bacteria, haemolytic colon bacilli, for example, which are present in the faeces in a small proportion of normal individuals, but then only sparsely, may as a result of an intestinal disorder appear in greatly increased numbers. On the other hand, a true pathological process affecting the colon may not produce a greater or more varied bacterial flora than may occur among healthy subjects whose diet has been at fault.

In a more recent article (178) he concludes thus:

"Much time will be saved and endless discussion, if it is realised at the outset that the presence of an organism in the faeces is not an indication of an intestinal infection with that organism.

Unfortunately the term "intestinal infection" has been so loosely employed, and so "readily proved" that it is without significance to those who have studied the bacteriology of the intestinal tract in man".

Cotton, a most enthusiastic exponent of the colon as a source of systemic disease, appears to lean towards the sub-infection theory (142-5). Not holding with the hereditary and psychogenic causation of mental disorder he believes that all functional psychotics owe their disabilities to foci of infection in teeth, tonsils and colons.

Draper (174-5) finds 20% of the colons he removes for Cotton shew gross pathological changes. However, Ewing (145) reporting on the histological appearances of these colons failed to find any change which indicates that bacteria have invaded their walls, blood vessels, or lymphatics. Even in the absence of such findings, he remains of the opinion that the damage to the epithelial structure is likely to be followed by untoward consequences.

Warren and Wipple (414) by suitable dose of the Rontgen ray destroyed the intestinal epithelium leaving empty crypts and naked villi exposed to swarms of bacteria in the bowel. Notwithstanding,

there was no invasion of the tissues, lymph, or blood by the alimentary micro-organisms found in the masses of exudate. This suggests that the intestinal epithelium is not the all-important barrier that protects the tissues from invasion and it is probable that other tissues or tissue juices have a protective mechanism which is of much importance and not to be neglected in estimating the resistance of the intestine to bacterial invasion. Finally Cotton's technique for the discovery of focal infection has been adversely criticised by most bacteriologists, (358)

On the clinical side Kopeloff and Kirby (359) in a series of 120 cases of manic depressives, praecox cases, psychoneurotics and psychopathic personalities found that the removal of all definite foci of infection in 58 did not bring about a higher percentage recovery rate than in a comparable 62 in which foci were not removed. In every case which recovered, recovery had been forecasted before treatment was instituted, and no case recovered in which a poor prognosis had been given irrespective of the treatment adopted.

It has been admitted by certain supporters of the toxæmia theory that the behaviour of the individual towards the hypothetical toxin is just as important as the action of the toxin on the individual. Thus we find Herter (275) writing: "We must content ourselves with the suspicion that chronic toxication through the absorption of similar quantities of the

same poisonous material produces different effects in different persons. That the mental and emotional peculiarities of individuals have a large part in fixing the type of nervous reaction has become apparent to careful students of pathological conditions".

More significant still is Monod's (458) statement that the toxins circulating in the blood of a patient A and causing great disturbance, might if run into the system of a patient B do no harm whatsoever, thus shewing that the soil is as important as the seed. That the soil is a very important matter has been conclusively demonstrated for an allied condition, and one which bears a much closer resemblance to a toxaemia of intestinal origin than does intestinal stasis. I refer to the acute food disorders of infancy. The persistent diarrhoea and vomiting, resisting in severe cases all forms of medication, and continuing until dehydration and collapse bring about a fatal termination, appear to present a perfect picture of bacterial or chemical poisoning. Yet the most assiduous research has failed to isolate a pathognomonic organism or a specific toxin, and post mortem examination has equally failed to shew any characteristic pathological appearance. It was not until Finkelstein (200) published his observations that any light was thrown upon this mysterious though common disorder. He found that disturbances of nutrition

in infancy could be divided into four types, and that these types represented the chief varieties of reaction of the child's system to the food given.

Their severity depended on two factors, the degree of unsuitability of the food, and the extent of the functional debility of the infant. He observed that a food which appears to suit a perfectly healthy child or at any rate produces no harm, very often sets up a serious illness in a weakly infant.

For health it is necessary that the structure of the body and the function of nutrition should both be normal; otherwise the child cannot assimilate a diet which may be quite suitable for a healthy one.

The truth of his observations will be found in the success which has followed their application to infant feeding. Strangely enough, the possibility that this congenital enfeeblement of the function of nutrition might persist into adult life has been little stressed by recent workers. General opinion seems to suggest that if a diet be scientifically constructed, it is then a suitable one for all individuals, and conversely, that disorders of nutrition are entirely the result of a faulty diet. The fault is according to McCollum (436) McCarrison (433) and others often a compound of deficiency in association with excess.

Taking a diet, not uncommon among the poorer classes, of white bread, margarine, condensed milk and tea, a minimum of imported meat and boiled

potatoes, McCarrison holds that such does not contain a sufficiency of vitamins to activate the cells of the digestive system to healthy function. Its richness in starch favours an increase in fermentative organisms, and makes relatively more deficient the vitamin necessary for healthy cellular activity. It does not contain sufficiency of salts to provide the proper medium for the chemical processes of digestion, nor does it contain a sufficiency of vegetable residue or cellulose to ensure a normal action of the bowel.

Cramer (150-1) has produced experimental evidence to shew that the functional integrity of the digestive tract is dependent on the presence in the food of certain substances with specific drug-like action very much in the same way as the functional integrity of the uterus is dependent on a hormone produced by the ovary. He found that fat-soluble A. vitamin has a specific stimulating effect on the intestinal mucous membrane which atrophies in its absence; and that water soluble B. has a stimulating effect on lymphoid tissue, on the processes of digestion, and on absorption from the intestinal canal. He observed that the first effect of vitamin A. deprivation closely resembles what occurs in X-ray intoxication as demonstrated by Mottram (471), namely an increase in the mucin secreting cells and an increase in mucin production going on to exhaustion. Finally the cells atrophy and bacteria penetrate into

the crypts left. In a healthy intestine Cramer states the bacterial and protozoal flora are confined to the centre of the lumen probably, as Bond (75) thinks, because due to the biochemical action of the mucin at the periphery. With the disappearance of mucin, the bacteria reach the intestinal walls and in the presence of a vitamin B. deficiency, invasion of the mucosa occurs with the production of a toxæmia.

Murlin (476), however, experimenting with vitamin B. finds that constipation which results from its deficiency is due to retention of faeces in the large intestine, and that the passage through the small intestine is normal. Wells (621) shews there is good evidence for regarding vitamin A. as consisting of two separate factors, a growth factor and an anti-neuritic factor, and vitamin B. as consisting also of a growth factor as well as its anti-neuritic factor. Cowgill (147) found that absence of vitamin B. in addition to the production of neuritis resulted in a decreased desire for food and inability to utilize it, and in this was confirmed by Findlay (199) and Werkman (622).

This is explained by Farmer and Redenbaugh (196) by the assumption that vitamin B. is a precursor of certain alimentary enzymes. Cowgill, Plummer, etc., (148) find that in severe degrees of vitamin B. deficiency there is anorexia, nervous and muscular symptoms, and gastric atony. They suggest a certain proportion of vitamin B. is essential for normal

gastric tonicity. However true these findings may be for laboratory animals, there is very little evidence that the existing vague ill-health in the general population depends on vitamin starvation. Hutchinson (408) states that he has never seen amidst the London Hospital out-patients any evidence that minor degrees of vitamin starvation are common among the general population. Moreover, Helen Mackay (408) points out that vitamin B. has such a widespread distribution and such a resistance to heat and storage that anything like deprivation in general is impossible.

Strangely enough McCarrison's experimental findings confirm the view that certain individuals inherit a tolerance for grave departures from the normal in nutrition. He found that of one hundred pigeons exposed under precisely similar conditions to vitamin starvation, 25% flourished, 50% remained at maintenance level, while 25% went steadily downhill. This can only mean that certain pigeons withstand the most gross disturbances in nutrition without being much affected, thereby depending upon their inherent resisting power.

On the clinical side Burnett (97) has shewn individuals may inherit an inability to handle a normal balanced diet. For him malabsorption is at the root of many of the disorders attributed to vitamin deficiency. In these cases the food ingested may be insufficient to supply the demands of the body and leave at the same time a residue sufficient to

stimulate excretion; or sufficient food is consumed, but on account of it being incomplete or faulty it passes too rapidly through the digestive tract. He brings evidence to shew that a food may be theoretically correctly balanced, and yet faulty for certain individuals who can only find intestinal health by adjusting their ways of eating to their own complex and delicately adjusted digestive apparatus (95).

Bryant (85) and Alvarez (19) have brought evidence to shew that the chronic intestinal invalid can be considerably helped, provided the diet is fitted to the individual and not the individual made to fit the diet. In the majority of cases as soon as a suitable diet is found for the patient the signs of "toxaemia" clear up, irrespective of the diet being an ideal one or not.

From this brief review it will be seen that there is no evidence that the intestine harbours disease producing poisons elaborated from the inspissated stool of constipation. The evidence, not here considered, is all to the contrary, namely, that true intestinal autointoxication is accompanied by diarrhoea and not constipation.

McNeal Latzer and Karr (411) calculated that 46% of the total faecal nitrogen in the distal two-thirds of the colon is bacterial, and found that in a formed stool the bulk of the bacteria are dead. Macleod (410) states that on an average diet after 24 hours the faeces amounts to 100 gms. This, if retained,

diminishes from inspissation to 20 gms., of which 5 gms. are bacteria mostly dead. In fact, inspissation and the formation of scybala are not the least important safeguards of the intestinal tract against intoxication. Lockhart Mummery in Diseases of the Rectum and Colon pointed out that all sufferers from constipation are by no means subjects of auto-intoxication, and conversely that many who suffer from autointoxication have neither stasis nor constipation. It is not uncommon, he says, to see a patient who has all the symptoms of intoxication have a daily action of the bowel. He has repeatedly noted the total absence of symptoms in the most extreme cases of colon stasis; the most alarming symptoms in other cases if faeces were retained for more than 24 hours; and finally, cases which only presented intoxication phenomena when a purgative was administered to relieve their constipation.

Hence it is pertinent to enquire: What is constipation and what is its relation to symptom formation? The generally accepted definition of constipation is that of Hurst (301), who defines it as a condition in which none of the residue of a meal taken eight hours after defaecation is excreted within forty hours. He divided all cases into two great classes:- intestinal constipation in which the passage through the intestines is delayed whilst defaecation is normal, and pelvi-rectal or dyschezia in which there is no delay in the arrival of the

faeces in the pelvic colon but their final excretion is not performed adequately. As regards the time of passage of the intestinal contents Hurst states an opaque meal fills the caecum in $4\frac{1}{2}$ hours, the hepatic flexure in $6\frac{1}{2}$ hours, the splenic flexure in 9 hours, the pelvic colon in 12 hours and the rectum in 18 hours. Jordan (326) gives slightly different figures, caecum $3\frac{1}{2}$ hours, hepatic flexure 5 hours, splenic flexure 8-12 hours, rectum 24 hours, and by 48 hours all should have been evacuated.

Most radiologists give figures approximating between these two and most agree that in both stasis and non stasis the head of the column reaches the different landmarks in approximately these times. Where difference of opinion arises is over the length of time during which the opaque material is retained in different segments of the colon. The two extremes are represented by De Martel and Antoin (417) who state that the caeco-colon should be empty after fifteen hours, and by Hurst who considers twenty-four hours within the range of normality. These times have not escaped criticism. Burnett (93, 94, 96), for instance, has pointed out that the large amount of barium given with a small test meal acts like agar agar and speeds up the progress of the material through the bowel. By the carmine method he finds that 62-134 hours is the variation of normal intestinal rate in health. Alvarez and Freedlander (20) using small glass beads as indicators found that

the rate of progress varies widely in normal healthy persons. They found that scarcely more than half of the ingested beads were passed by the end of the second day. Sometimes days or weeks elapsed before all the beads were recovered from the stools. No symptoms were presented by individuals who required a week or more to pass 70% of the beads. They believe, along with Burnett, that fast rates, that is, an evacuation of 85% of the beads in 24 hours, are associated with the passage of soft badly digested stools. Kantor (333) assuming 15 hours to represent the normal emptying time of the caeco-colon finds this time was exceeded in:-

549	of	1,229	unselected gastrointestinal	or 44.6%
			cases	
129	"	264	asthenics	" 48.8%
216	"	437	cases presenting average caeca	" 49.4%
10	"	17	" " high	" " 58.8%
61	"	100	" " low	" " 61.0%
48	"	62	" " redundant colon	" 77.4%

In the cases with the highest percentage of constipation, i.e. cases of redundant colon, symptoms of toxæmia were conspicuous by their absence, while in cases of low caeca, especially characterised by the so-called toxæmic symptoms, the incidence of constipation was much less. More striking still was the low percentage of constipation amongst the out-and-out asthenics, confirming the non-relationship of constipation to asthenic symptoms.

According to Alessandrini (7), under physiological conditions two zones exist in which stimulation induces an expulsive peristalsis. One consists of the caecum and ascending colon, the stimulation of which determines the great peristaltic movement of Holzknecht. The other consists of the ampullary portion of the rectum whose stimulation may provoke reflexly a large expulsive movement, such as may be caused by a glycerine suppository or the very act of defaecation.

Prior to the demonstration of spastic constipation by Fleiner (201) atony had always been considered the fundamental factor in the production of the condition. Lane's operative treatment of chronic constipation was based largely on this assumption. Even surgeons who did not follow him blindly felt that it was a reasonable procedure to perform a hemicolectomy, and by removing a toneless caeco-colon allow the remainder to function unhampered by the "cesspool" behind it. Yet Lane, in a communication quoted by Coffey (135) admitted that his operation did not cure constipation. Hurst (301) Flint (206), Dawson (161) and others all report that neither colectomy nor hemicolectomy cures constipation, or if it does, it leaves the individual in a worse state than ever by converting the constipation into an uncontrollable diarrhoea. From this we may conclude that the caeco-colon is not an important factor in the production of constipation,

an opinion also supported by radiological evidence.

Earlier observers like Schwartz (545) and Skinner (560) thought they could differentiate an atonic from a spastic type of constipation radiologically, but Carman (110) and later observers all agree that whereas states of atonicity and spasticity are frequently observed radiologically they are not necessarily associated with constipation.

Conversely an obstinately constipated individual may present the picture of a normal functioning colon. Hence we must look to the distal end of the tract to explain the condition. King (350) has shewn that stimulation of the skin area round the anus and the anal canal itself can inhibit intestinal movement. He suggests that haemorrhoids may be the cause of constipation and not constipation the cause of haemorrhoids. It is undoubtedly the case that the cure of many apparently trifling local conditions in the anal canal may result in the complete cure of a most obstinate constipation.

Hurst (298) who has so exhaustively dealt with the subject of constipation states that dyschezia is by far the commonest form. In the viscerotonic or chronic intestinal invalid he regards weakness of the abdominal muscles and of the pelvic floor as the most important factor producing inability to empty the rectum and pelvic colon.

Clinical experience however shews that individuals with relaxed pelvic floor and atrophied abdominal muscles may have a regular bowel movement.

and Kantor's figures quoted above shew that asthenia plays little part in the production of constipation. Moreover we meet with individuals of perfect physique and whose dietetic habits are above reproach and yet who are constipated. An explanation of this anomaly would appear to lie in a consideration of the recto sigmoid apparatus. Mayo (430) and Hurst (305) believe that this possesses a definite mechanism which retards the faecal current and prevents the continuous progress of the intestinal contents into the rectum. When the faecal column which has been held up enters the rectum the desire to defaecate is provoked, This reflex is established by means of the "muscle" sense of the distended rectum and initiates a mass movement which empties the rectum and part of the pelvic colon.. Secondary mass movements occur and continue until under normal conditions the entire large intestine below the splenic flexure is completely emptied. According to Soper (567) the formation of faeces probably occurs in the iliac colon. This is particularly true of the fragmentary form of constipation in which small hard round masses appear in the faeces. Soper finds that spasm or hypertonic contractures of the apparatus are a frequent cause of obstinate constipation. Strangely enough he finds that atony of the apparatus may similarly be associated with constipation, and in cases where the apparatus appears to be absent and there is no line of demarcation between rectum and pelvic colon the constipation is exceedingly obstinate. Obviously when spasm holds up the faeces in the pelvic colon

inspissation will proceed to a maximum degree, so that eventually only a small feebly stimulating stool will enter the rectum. In atony, on the other hand, the constant pressure of faecal material in the rectum would result in raising its threshold to such a degree that the defaecation reflex cannot occur without an abnormal stimulus.

Two clinical observations support the theory that constipation in the chronic intestinal invalid is the result of spasm of the recto-sigmoid apparatus. Firstly, the institution of a bland non-irritating diet plus the administration of sedatives often succeeds admirably in relieving the condition. Secondly, the intolerance of these patients to ordinary purgative medicine. A simple laxative either fails to have any effect on the patient, or else it produces intolerable griping without emptying the bowel properly. In milder cases paraffin succeeds, probably by reducing the colonic irritation. In severer cases paraffin fails, and if taken in sufficient quantity simply oozes from the anus without assisting in defaecation.

In the atonic type purgation equally produces griping, the result of irregular and inco-ordinate contraction of the colonic musculature, and these cases require a daily enema to wash out the colonic contents.

How this condition of spasm originates requires some explanation. Now Leube (395) many years ago

pointed out that simple pressure of the finger in the rectum is often sufficient to produce immediately a series of symptoms in a sensitive individual which closely resemble those which are met with in the toxæmic patient. Alvarez (16) shewed that a pressure of 2-3 mm. Hg. is perceived by the rectum and that 20-60 mm. causes acute distress.

Donaldson (169), in a series of carefully conducted experiments, shewed that the symptoms presented by those seeking relief from constipation cannot be taken as unquestioned evidence of the absorption of toxins, and that in cases of ordinary constipation toxic substances are not necessarily absorbed in the blood, nor are they present in the faecal mass in sufficient amounts to produce symptoms if absorbed. His experiments revealed that the mechanical irritation of the pelvic colon and rectum are alone sufficient to produce the typical symptoms of autointoxication. He found that "the nervous system was the distributing agency and that all tissues shared in the disquietful state, probably the result of endocrine unbalance".

Gee, some years ago, said that "many of those who are continually complaining of constipation are suffering more from fear and hypochondria than from anything else. It is no law of Nature that the bowels should be relieved punctually once in twenty-four hours". As we hope to shew later, fear and anxiety is a common cause of spasticity. If an

individual is harassed by the fear that the failure to obtain a daily evacuation is productive of bodily harm, his anxiety only increases the spasm from which he seeks relief by purgation. To the muscle spasm is now added colonic irritation and a vicious circle results in which, in established cases, it is difficult to dissociate the mental from the physical.

Intimately associated with constipation in the chronic intestinal invalid is the condition now generally referred to as muco-membranous colitis. G. van Swieten on page 193, Vol. I, of his "Commentaries upon the Aphorisms of Boerhaave" (London 1744) quotes an account from Galen, in which the latter reports having experienced in his own person an attack of severe abdominal pain accompanied by the evacuation of much gelatinous material in the stool.

Van Swieten then proceeds to deal with the condition as if it were a manifestation of what we would call to-day the exudate diathesis. Morgagni (465) described the finding post mortem of gelatinous deposits on the intestinal mucosa, but it is not until we come to Abercrombie (2) that we find a clear cut picture of the clinical condition which Powell (502) later raised to the status of a clinical entity. To this Mason Good (239) gave the name of tubular diarrhoea, while Whitehead (559) termed it mucous affection of the intestines. Sireday (559) was the first to suggest that the affection was a secretory

neurosis rather than a true inflammation, and in this view he was upheld by Da Costa (155) in America. Later observers were divided into three groups, some regarding it as a pure neurosis, others as partly neurosis and partly inflammatory, while a third held that the affection was an inflammatory eruption of the intestinal mucosa, very similar to the aphthous ulceration of the mouth which is such a common symptom in the intestinal invalid.

Glenard was the first to suggest that mucous membranous colitis was not a clinical entity but simply one of the symptoms of enteroptosis. Maurice de Langenhagen (386) pointed out that enteroptosis may be met with unaccompanied by mucous membranous colitis, and that colitis may be seen without enteroptosis; in the latter case the symptom is slight, whereas in all cases where it is prominent, enteroptosis co-exists. He was the first to clearly to indicate the sequence of events. (1) Stubborn and prolonged constipation, (2) the sudden appearance of glairy discharge and membranes in the stool with pain, (3) intensification or appearance of functional disturbances of the stomach and nervous system, along with increased manifestations of enteroptosis. A few years later Hurst (300), (304), (306), drew an analogy between it and asthma and promulgated the view that the colon responded with oversecretion of mucus to similar types of nervous influences which in other cases produced asthma. It is to be remembered

that mucin is a normal constituent of the colonic contents. When this mucin, which contains no albumen or pus cells, is poured out in excess and retained in the bowel by spasm, it is then coagulated by mucinase so that, when finally expelled, it is passed in the form of a jelly or membrane.

Irritation from long-continued spastic constipation or from injudicious local treatment may result in a true inflammatory colitis being super-added to the original neurosis. Dawson (161), however, has brought forward the most cogent evidence in support of the view that muco-membranous colitis is only one aspect of a disturbance which sweeps through the alimentary tract from end to end. Sometimes this disturbance begins in the upper alimentary tract with an unpleasant taste in the mouth, furred tongue, red pharynx, epigastric pain, nausea and distension, to be followed, a few hours later, by the characteristic pain and passage of mucus.

In other cases griping pains and the passage of mucus appear first. In one such case with an appendicostomy opening, the colon was washed out at the first onset of symptoms. The washing was found to contain undigested food, shewing that the upper alimentary tract was disturbed even before the disturbance was appreciated by the patient subjectively.

He concludes that the most obvious source of such a widespread, and at the same time apparently

selective disturbance, must be in the central nervous system.

From the evidence so far produced, it is permissible to assume that muco-membranous colitis and constipation in the chronic intestinal invalid are simply manifestations of a disordered neuro-muscular mechanism. More recently an attempt has been made to explain it by the theory of allergy on the same lines as the latter is used to explain asthma. Coca (131) has shewn that allergy is a state different from anaphylaxis in three respects in that (1) the exciting agent need not be antigenic, (2) it is based on a natural inherited make up, and (3) the phenomena of desensitization is entirely wanting. Duke (179), Andresen (21) and others have reported cases of attacks of abdominal pain of obscure origin which disappeared after the removal of certain articles of food from the diet. They do not specify whether these attacks were accompanied by the passage of mucus, but Edward Hollander (284) has reported six cases, all presenting the classical picture of muco-membranous colitis, in which the attacks disappeared after the taking of offending articles of food had been given up.

The fact that many chronic intestinal patients are unable to tolerate certain articles of food is a well-established clinical observation, but whether the explanation of it is advanced in any degree by attributing it to the equally obscure condition of

allergy, is a moot point.

THE RELATIONSHIP BETWEEN PHYSICAL SYMPTOMS,
MENTAL REACTION, AND CONSTITUTIONAL MAKE - UP.

The classical researches of Pavlov (Conditioned Reflexes, Lond. 1927), and Cannon (Bodily Changes in Pain, Hunger, Fear and Rage, N.Y. 1915) have demonstrated the profound modifications in organ function which can be brought about in the healthy animal by a variety of emotional states. In the case of the digestive tract they were only offering an experimental demonstration of phenomena long recognised in the practice of medicine. Sir Thomas Watson (616) summed-up this clinical experience when he stated that there are habits of mind, and habits of life which have no direct relation to the organs of digestion, and yet exercise a material influence over their function. Goodhart (240) went further when he wrote: "If I were to write a book about indigestion, I should first devote myself to a volume on diseases of the nervous system ... The intestine is a highly sensitive organ from which we can often read the temperament and disposition of the man; it is an index of the state of nervous tone and vigour of the patient".

A decade later and the radiologist had begun to read off from the screen the mental state of the individual whose gastrointestinal tract was under investigation. Barclay (42) was amongst the first to observe a high transverse stomach suddenly loose its

tone, so that the greater curvature dropped into the pelvis the moment the subject was suddenly startled by a door slamming. Horder (287) reported observing a similar result when the screen slipped upwards and struck the patient's chin. Langdon Brown (81) recorded the case of a nervous man called up for military service in whom the radiograph shewed atonic dilatation of the stomach. After the patient had obtained exemption, his stomach was re-examined and was found to have regained both its tone and position. Some months later, when his exemption came up for review, the stomach had reverted to its atonic form.

The most complete investigation of the effect of emotion on the gastro-intestinal tract in healthy individuals has been that undertaken by Wingate Todd (591). He examined a series of freshmen on their first day in the anatomy class and then a year later. Invariably the second radiograph shewed a different picture from the first taken the year previously when the student's emotional state was one of bewilderment, with a certain degree of fear and anxiety. He found that all parts of the intestinal tract are exceedingly sensitive to emotional or nervous conditions. The stomach becomes atonic in outline, though not in movement or emptying time, as Kast (336) had previously observed. The duodenum shews pseudo-stasis. The transverse colon exhibits a spasm which may absolutely inhibit the onward passage of its contents. The cardia and pylorus drop, though

not to such an extent as do the greater curvature, the pyloric vestibule, and the gastric tube. When there existed a spasm of the transverse colon, the peristaltic wave in the lower ileum became exceedingly slow. Investigating individuals in a poor state of health Kast (336) found that, although both mental and physical exertion slowed the emptying time of the stomach, mental had the greater effect, even in a state of complete physical rest.

Ludlum (406) investigated the gastro-intestinal tract in a group of psychotics and found a direct relationship between the type of mental reaction and the physiological state of the gastrointestinal tract.

Henry (274) repeated his investigation on a much more extensive group of cases which comprised every possible type of mental reaction, from the mildest psycho-neurotic to the most profound psychotic.

He found in depressed patients, the greater the depression the greater the intestinal sluggishness.

In chronic dementia praecox patients there was a tendency to return to normal gastrointestinal functioning when they had succeeded in making some adjustment. Paranoid states shewed a tendency to be associated with higher position and higher tonus of the hollow viscera than did praecox states, except in the region of the pelvic colon and rectum where hypomotility and hypotonicity was the rule.

Psychoneurotics shewed definite hypertonicity or even spasticity with hypomotility. Henry concludes that

certain definite physiological visceral changes accompany and are intimately associated with different types of abnormal mental reaction. He suggests that the so-called normal variations in gastrointestinal functioning, and even some gastrointestinal states believed to be pathological, may be due, in part, to psychological variations met with in normal individuals.

In the case of the secretory curve, although it has been well established by both laboratory workers, and by clinicians like Hurst and Izod Bennet (302), that emotion can profoundly alter its character, this observation has little bearing on the explanation of subjective symptoms. The findings of Hurst (294), that the stomach is insensitive to the maximum HCL concentration ever observed in life, and of Alvarez (11) that it is only when the gastric juice regurgitates to reach the sensitive lower pharynx that "burning" is sensed by the patient, have found corroboration in the large number of cases of "hyperchlorhydria" examined by the fractional method. Many of these have a low acid titre and those cases with high acid titres, without exception, fail to reveal any reduction in the acid content after the symptoms have disappeared and a clinical cure has resulted.

Assuming then that gastrointestinal function is to a large extent dependant upon mental factors, it is pertinent to inquire how this may be brought about. The dualistic concept of mind and body has been almost

axiomatic in medical thought. From this has been deduced that one of the functions of the mind is to distribute a certain amount of energy for the maintenance of healthy functional activity of the body. In the case of the digestive system, symptoms were supposed to arise when, in the words of Goodhart, "energy necessary for digestion is consumed in other directions". This concept of the dissipation or exhaustion of nervous energy resulting in organ malfunction and symptom formation was popularized by Van Deusen (165) and Beard (54) under the term "neurasthenia". It received the approval of Charcot (224) and other leading neurologists. With the rise of modern psychopathology, it was found that this simple concept of exhaustion was insufficient to explain the causation of the many new types of abnormal mental reactions which came to be isolated and identified. First Charcot (224) separated the hysterical reaction, then Janet (322) the obsessional and the phobias, and finally Freud (214) the anxiety neurosis. According to Jones (323) if a series of cases, in which the diagnosis of neurasthenia had been made, were submitted to exact analysis, it would turn out that the majority of them were really cases of anxiety neurosis, obsessional neurosis, or of some form of hysteria; that many were mild or early forms of dementia praecox, and manic depressive insanity; that a small proportion were toxic psychoses, early general paresis, or post influenzal depression; and

that only a minimal number, fewer than one per cent, were really cases of neurasthenia.

When a group of chronic intestinal invalids is investigated on the psychological side, it at once becomes evident that no one single form of mental reaction is common to all; moreover the reaction which is present, is not, as a rule, of a type which would enable it to be readily classified. Hysterical trends, obsessional trends, and so on, may be observed in individual cases, but there is no consistent association of one definite form of mental reaction with the physical state. The most that can be said is that some departure from normal mental function is fairly regularly associated with the departure from normal physical functioning. De Giovanni (225-7) was the first seriously to investigate the association. According to him, it was not a case of there being several different neuroses but rather a nervous diathesis which could exhibit many clinical forms. This diathesis resulted from a special constitutional organisation.

In this view he was supported by Viola (604-5) who, from a study of 400 males in Northern Italy, found that the type of neurosis exhibited by an individual depended upon the body build. According to him, all individuals are either micro-splanchnic, macrosplanchnic or normal, a classification that corresponds to the narrow back, broad back, and normal of Goldthwait. He assumed that the autonomic

and central nervous systems were both independent and antagonistic functional units. With the failure of the trunk to develop in the microsplanchnic, the autonomic system, which it housed, equally failed to develop and the central nervous system became dominant; on the other hand in the macrosplanchnic, the autonomic system developed excessively and became dominant. In the normal there was a balance between the two systems. He concluded that the soil of a psychoneurosis is prepared by complex endogenous factors. These may appear externally under the aspect of morphologic disharmonies arising within the organism during its prenatal life and during the period of development.

Both the developmental and morphologic defects or excesses and the neurotic constitution have the same genetic basis. The microsplanchnic is a candidate for the asthenic forms of psychoneurosis because of the deficient muscular development and poor organic function which results from a faulty development of the autonomic nervous system. Conversely, the macrosplanchnic develop sthenic forms. Both the asthenic and sthenic forms differ from the "pure" clear-cut types of neurosis found in individuals of normal build. However unsatisfactory this theory may be it was at least an attempt to justify the empirical observations that the ultimate character of an individual can often be estimated from his appearance. On this expirical observation was based

the concept of "constitution" as used by the physicians of an earlier period. After a somewhat prolonged eclipse, the study of the constitution has again come into its own from the assembling of four sets of data, those of photography, anthropometry, endocrinology, and psychiatry.

The most notable attempt is that of Kretschmer (363). He divides mankind into the athletes, the pyknic or well-nourished people, the leptosomic or asthenic people, and the dysplastics or victims of endocrine or other dysplasias. (Adler's inferiority complex). Applying this classification to the psychoses, he found that two-thirds of manic depressive cases are of the fat-faced, ruddy, soft-bodied or pyknic type, while of the schizophrenic cases, one half are pale asthenics, one fourth athletes, and one fourth dysplastics. From this it follows that the organic or physical configuration and the functional or character traits of certain psychoses are probably not independent, but that there is a fusion of the psychic with the somatic. We have here apparently a definite correlation between facies, habitus, and mentality. The line of demarcation however is by no wise rigid, since, by the crossing of hereditary traits, a schizoid mentality may coexist with a pyknic physique and vice versa. In women, also, the physical characteristics are less sharply defined than in men. Moreover, racial and social affiliations, and environment in

its widest sense may superinduce transient or permanent praecox traits, although the constitutional basis of character of another type remains unaltered. It has been even suggested that the body type itself may alter. Mollenhoff (457), for instance, claimed to find the asthenic type more frequently among the young, and the pyknic more frequent in advancing age. Wertheimer and Hesketh (624) studied non-psychotic individuals in the light of Kretschmer's work. They find that in every-day life personalities are judged usually by the affective attitude they shew towards the environment, and especially to other members of the social group. Certain persons obtain satisfaction chiefly through the affective reactions experienced from contact with their fellows. Not only do they react emotionally to the experiences of life which entail co-ordination or disagreement with others, but they are always fundamentally in affective contact with their whole personal and social environment. Physically such individuals are pyknic, but these observers prefer to describe the mental reaction of the pyknic habitus by the term syntropic.

Others however, find satisfaction in difference, in detachment, and in isolation from their personal and social environment. They obtain satisfaction, not from contact with other personalities, but from the interplay of their own mental experiences on the intellectual and imaginative levels. These latter tend towards an asthenic habitus and their mental

state is described as idiotropic. Mr. Pickwick with his pyknic habitus was of a syntropic temperament, while the long lanky Don Quixote undoubtedly possessed an idiotropic one. Clinical experience shews that whereas the chronic intestinal invalid may be of any body build, the severer degrees of invalidism are more likely to occur in those of an asthenic habitus. The demonstration of a direct association between asthenic habitus and an idiotropic mentality explains why so little can be done for the more severe degrees. The subjective sensations of malfunction in long-standing cases tend to invade and dominate the whole personality to such an extent that the patient is no longer able to get in touch with the psychological influence of the physician.

I fully recognise that much of the work done on constitution is uncritical, and that many of the types of body build recognised are largely subjective in character and not clearly defined in measurable terms, nor are they of necessity associated with ill-health. C.M. Jackson (317), for instance, has demonstrated in the case of healthy adults that conclusive evidence is lacking that the slender asthenic thorax is inefficient in function, or that the pulse rate and blood pressure are directly associated with habitus. Yet in the case of ill-health there is now sufficient evidence to suggest an association between habitus, a special mentality, and a tendency to intestinal malfunction of congenital and possibly inherited origin.

Although the young infant can scarcely be described as possessing either a habitus or a mentality, yet Finkelstein's work shews that in its reaction to normal food it may display an inherited weakness of structure and function at any period from birth to weaning. On the mental side such infants tend to sleep badly, are easily startled, restless and whining after the best possible digestive adjustment.

In early childhood there appears in certain children symptoms which bear a striking resemblance to those of the adult intestinal invalid. The classical description of these was given by Eustace Smith (563) under the term "mucous disease", a term which has been replaced by chronic intestinal indigestion of children. Later observers have noted that these children tend to be tall for their age and of a slim build. Thus Seham (551) found in his cases, that the child was on an average 2 inches taller, had 5 inches less chest circumference, and was 5 lbs. under weight, compared with a normal child of the same age.

While all observers have noted its association with nervous symptoms, Cameron (103) has specially stressed the association of amyotonia, pallor, and ready exhaustion in these cases. The amyotonia leads to postural defects, and an absence of that facial play and expression which is so characteristic of health. In severe cases there may be

restlessness, with incoordinate movements of the small muscles of the face and hands; abdominal pain, vomiting, constipation, and "negativism". He regards these patients as candidates for the "pexies" and "ectomies" of adult life. Why many of these individuals attain normality while others indeed drift into the state of the chronic intestinal invalidism of adult life is best explained by the modern concept of "constitution". For the older physicians constitution was a fixed state which an individual brought with him from his embryonic state and which shadowed him throughout life. Kraus (362), one of the pioneers of the newer study of the constitution, demonstrated its dynamic nature in contradistinction to the old static view. He has pointed out that there are two factors in every individual, the genotype or the inheritance pattern, and the phenotype or the realized individual as he is at a particular moment. The phenotype is the result of a series of reactions between the genotype and the environment. If this be so, the constitution of an individual, as Stockard (580) pointed out, is actually a different thing at different life periods.

The final adult constitution is therefore a somewhat uncertain accomplishment which has been affected and influenced by both internal and external factors acting from birth. Draper (171-3) defines constitution as that aggregate of hereditary characters, more or less influenced by environment,

which determines the individuals reaction, successful or unsuccessful, to the stress of the environment. According to modern biological thought there is something inherent in animal cells which drives them to divide, multiply, and differentiate into special organs. From this it follows that the course of life may be roughly marked off into three epochs according to the changing relationship of viabiotic to necrobiotic forces. The capacity which cells possess of growing and developing in a fashion characteristic for a given species is laid down in the genetic plan and is probably passed on through the medium of the chromosomes. For Davenport (157) the phenotype is the up-to-the-instant result of hereditary forces or idiokinetic influences distorted by environment pressure, or parakinetic influences. He considers that there is good reason to believe that the endocrine glands which exert such important effects upon growth are directly influenced by emotional stimuli. For example, fear in childhood, sense of inferiority at puberty, etc., may deflect the idiokinetic forces. So it comes about that when a patient consults a physician he inevitably presents a trinity of problems, the disease process, the malevolent external agent and the man himself.

The aphorism that to secure good health and a long life a man should choose his parents wisely has received abundant proof from the biometrical studies of Raymond Pearl (494). Yet though "we are woven

out of the warp and woof derived by the mitotic division of two parental sex cells making a garment infinitely finer in texture and more intimately blended in its structural elements than any fabric" De Beer (57) reminds us that hereditary does not account for the individual but merely for the potentialities, some of which are realized from the action of external stimuli. Hence it is not sufficient to postulate the existence in the germinal chromosomes of genes corresponding to the cycloid, schizoid, and other anlagen of Kahn (328), Hoffman (281), and Barret (43), since a suitable mental environment is just as necessary for the development of mental characters, as a suitable physical environment is for the development of physical characters. As individuals develop they tend to choose their own mental environment according to their own inherited tastes and aptitudes. Since mental environment is extremely complex and intimate in the way it impinges upon the developing organism, it will have a much greater importance in determining the final mental state than the physical environment. But where the inherited potentialities are not strong enough to enable the individual to choose his own environment, then we find environmental stresses distorting the mental and physical and producing an association more apparent than real. When the normal course of mental development is deviated or distorted, the end result may be observed, according

to Meyers (447), on one of three levels, the vegetative, reflex or psychological, depending on whether it reveals itself through the action of the visceral organs, the sensori-motor system, or the complete personality as a whole.

If we now assume as a part of the physical environment an inherited physical defect as may be presumed to exist in dysplastics like the marasmic infant, the nervous child of Cameron, the child with chronic fatigue of Seham, etc., we have then the state of affairs to which Adler (5) called attention, namely organ inferiority with all its potential psychical consequences. As is well known, Adler traces all forms of neuroses to a feeling of inferiority based on some actual organic defect. According to him an individual, possessing such a defect and becoming more or less clearly aware of it, acquires a feeling of inferiority which he attempts to disguise. His main purpose or goal in life then becomes set in the direction of compensating for this defect and so overcoming the feeling of inferiority. In some cases the effort is successful but more often it fails. In the latter case the individual takes flight from reality and develops symptoms, which he uses as an excuse for his failure to attain the superiority he secretly desires. The symptoms justify him abandoning the role of a useful member of society and securing for him in the domestic circle the attention which is denied him in

the wider social world.

It is to be regretted that Adler did not pursue this important line of investigation. Unfortunately the examples he gives in his book are not so convincing as they might be if he had concentrated upon the digestive system.

The intimate connection between the mental and physical phenomena observed in chronic intestinal invalidism can best be explained by the Adlerian theory which after all, seems but to be a special application of failure in adaptation. As Ruggles Gates remarks in "Nature" of November 6th, 1926, one of the most remarkable things about healthy organisms in general is the stability they often shew under altered conditions of development, both in the physical and the mental characters, and their power at the same time to adapt themselves to these altered conditions, if it is to their advantage to do so.

C.P. White (626) has pointed out that adaptability is one of the three fundamental principles of life. None the less its range varies greatly from individual to individual. On the one hand, we have the type of case reported by Murray (477), where a patient with a grave organic lesion falsifies the gloomiest prognosis as regards life and efficiency by leading an active, useful, and happy existence long beyond the span prophesied for him. On the other, some of the worst cases of chronic intestinal invalidism lapse into a vegetative

life without presenting any lesion recognisable by the pathologist. Lord Dawson (161) suggests the chain of events in intestinal invalidism originates in a congenital over-responsiveness of the abdomen to nerve impressions. In these individuals fatigue, fear, anxiety, and intensive endeavours manifest themselves in their hollow viscera as disturbances of rhythm, motility, and secretion. These in turn lower the threshold of the nervous system until slighter and slighter disturbances become perceived. A state of mind is then added to a state of body, and the individual is reduced to a condition in which the mind is completely subjected to bodily sensations. This view seems too narrow if the claim be substantiated that it is possible to recognise in infancy and in childhood the onset of the condition, or as Cameron puts it: "to see these children as they grow to adult age become candidates for the operation of colectomy or colopexy". Nor does the theory of the over-responsive abdomen explain the symptoms outside the gastrointestinal tract, the "status catarrhalis", the amyotonia, pallor, albuminuria, irregular temperature curve, etc., of children; the fibrositic, the menstrual and other associated symptoms of adults.

The only theory which appears to cover all possible variations of the symptom complex is the theory of constitutional inadequacy. By this is meant a state of physical and mental make-up,

congenital and possibly inherited which handicaps the individual in his adjustment to the various environmental stresses, using environment in its widest sense. As Hyslop (314) puts it, these individuals are like poorly constructed automobiles, made out of "spare parts" and poorly assembled, who go clanking through life. Prolonged observations of the chronic intestinal invalid invariably reveal departures from normal functioning in regions outside the gastrointestinal tract. Some of these have been long recognised as the "visceroptotic habitus", the postural defects, etc., etc. Associated with these various disorders of body function, it is the rule to find the individual emotionally unstable, with a reduced capacity for intellectual effort, and an inability to assume responsibility. We find that adolescence and the climacterium are passed through with much greater difficulty than in normal individuals. Finally vasomotor, circulatory, endocrine and other disturbances almost invariably appear at some time or other. All this is but a restatement of an old viewpoint.

Many years ago Clifford Albutt (8) described life itself as a series of physiological processes, of which "diseases" and period of good health may be regarded as "phases or modes of growth". He concluded that morbid states are but members or terms of a series though commonly diagnosed and treated in practice as independent self-limited

diseases. Charcot (122) insisted that the condition of the patient is only an accident in the history of the disease, just as each individual is an accident in the history of humanity. Evidence in support of this was given by Sir James Mackenzie when he stated that not more than one-third of all patients who complain of symptoms can be assigned to a definite diagnostic group. Rowland (533), working at the James Mackenzie Institute, found that out of a total of 974 private and hospital patients, no less than 49.48% fell into the group reserved for cases shewing uncoordinated symptoms with no recognisable cause.

When we survey such a diverse group of conditions as general nervousness, so-called chronic appendicitis, the gastric neuroses, "intestinal toxæmia", hay fever, asthma, paroxysmal rhinorrhoea, painful flat foot, and the so-called rheumatism of the 3-4 decades, dysthyroidism, neuro-circulatory asthenia, etc., there is, in Osler's words (488) a positive advantage in recognising the affinities and the strong points of similarity in affections usually grouped as separated diseases. For by recognising the affinities, we seek for some unifying factor underlying the whole, and realise the futility of a therapeutics devoted solely to the one or other system where the symptoms happen to predominate. The only unifying factor amidst such diversity is a constitutional inadequacy, manifesting itself in all systems, but more pronounced in one than another.

When the degree is greater in the digestive system than elsewhere symptoms will tend to appear early, since for normal growth it must work at continuous high pressure. Circulatory malfunctioning will not tend to appear until the emotional stresses of puberty and early adult life make themselves felt, while the muscles and joints may succeed in disguising their deficiency until the viabiotic forces have become equalized by the necrobiotic ones of late middle life. In all such individuals, a more or less inadequate mentality is trying to adjust itself to the handicap of poor physical function. According to the degree of mental handicap the individual may either triumph over, accept, or become the victim of his physical inefficiency.

Without relaxing any efforts to improve the physique of the child born or unborn, it should not be forgotten that some of the great figures in history as well as a host of unknown, if no less efficient workers, have triumphed over physical imperfection through a mental adjustment to their difficulties.

THE CLINICAL CONDITION
SYMPTOMS AND TREATMENT.

The following clinical observations are based on the study of a series of cases observed in general practice.

When the notes of 1,200 consecutive patients were examined, it was found that 152 had sought advice for the relief of symptoms which centred round the gastro-intestinal tract, symptoms which, in Mackenzie's words, were uncoordinated and for which no recognisable cause could be found. These patients fell into two groups. One group, 41 in number, had already received investigation and treatment without obtaining relief before coming under my care. They may be regarded as presenting the condition in its established, chronic form. The other group, 111 in number, consisted of individuals seeking advice for the first time, and therefore presenting a diagnostic as well as a therapeutic problem.

For this reason I propose to consider the two groups separately: the first group, to illustrate the symptoms and physical findings when the condition has permanently established itself resistant to treatment; the second group, to elucidate the diagnosis and the prevention of chronic invalidism supervening in cases recognised early.

GROUP I

This group consists of five males and thirty-six

females.

SYMPTOMS

The four cardinal symptoms of this group were general weakness, abdominal discomfort, constipation, and flatulence.

GENERAL WEAKNESS

The patients state that the illness began with a gradual failure of energy, both mental and physical. Before this onset they claim, as a rule, to have been quite well in mind and body. Close questioning reveals the fact, however, that they had been never quite like their associates; never capable of the same amount of sustained work, physical or mental, although at times capable of an intensive effort which surpassed even the best of their more robust friends. Then they noticed a lessened ability to make this same effort and they began to realize that they had fallen below their own average standard of endurance. I found in the whole 41 cases that this state of affairs had existed for a longer or shorter time before the development of other symptoms. It was not until other symptoms had developed that they sought advice; in consequence, this general weakness had come to be looked upon, by both the patient and the physician, as something which had followed in the train of the other symptoms instead of preceding them. With the realization of their inability to "rise to the occasion", a certain degree of mental depression follows, and a mental searching for a physical

explanation then begins.

With the development of further symptoms, and the fixation in the mind of a "cause" for the general weakness, the latter tends to grow worse, producing a slowly, but steadily increasing, incapacity to lead a normal life, physically, intellectually, or emotionally. Four stages may be observed in this downward progression. In the first stage, the physical effort alone fails; in the second, both physical and mental effort is a failure with the will-to-do impaired, in the third, the will disappears; and finally, the individual lives in and for her symptoms. She then becomes strangely indifferent to losing everything that makes life worth living for the normal individual, and appears to find complete satisfaction in the submissive attention and sympathy of her relatives. More rarely, instead of becoming a torment to her friends, she adopts such an attitude of humble resignation that she seems to continue living solely from a sense of duty.

Strangely enough, even the most "exhausted" cases can at times act energetically when some dominant emotion comes into play. For example, one patient with a strong "fixation" on her father, whose death dated the onset of her illness, never fails to visit his grave on the anniversary of his death, although she spends the greater part of the year in bed as a confirmed invalid. On one occasion, taking a

sudden dislike to her room, she was able to rise and assist in the removal of the furniture etc., to another, working for six hours continuously, although usually she was unable to maintain the erect posture for longer than half-an-hour at a time.

Again, those who find that they are quite unfit for the lightest household duties can often play tennis for a whole afternoon without fatigue. This apparently irrational behaviour suggested in several cases the adoption of a hectoring attitude as a therapeutic measure. The result is usually unfortunate. Quite submissively they will carry out instructions to behave like a normal individual only to retaliate in a few days with a severe attack of mucous colitis. The rarer submissive type of exhausted patient equally astonishes the observer at times. One of these nursed her husband day and night for six months until his death from malignant disease, although before and after she had to spend the greater part of each week in bed.

There seems to be an almost inverse relationship between exhaustion and other symptoms. The individual who is continually seeking relief for an ever fresh pain or abnormal sensation is usually so active in this pursuit that weakness or exhaustion can hardly be said to exist. On the other hand, in the one who is "too tired even to think", pains and abnormal sensations tend to sink into the background. Though these states may alternate in the same person,

the patient as a rule, remains true to type, the "painful" being always "painful, and the "exhausted" always "exhausted".

There is no relationship between body weight and the sense of weakness. Not infrequently a moderately thin person will declare that she always feels worse when she starts to put on a little extra weight.

ABDOMINAL DISCOMFORT

The variety of abnormal sensations arising from the abdominal organs in these forty-one patients is beyond description. For practical purposes they may be divided into two groups, painful, and non-painful. In the present series where the condition is long-standing, true abdominal pain is conspicuously absent. The majority state that at the beginning of the illness they had suffered severe pain in one or other region of the abdomen, but since they have been under my observation this has not been a prominent feature. Attacks of acute pain in the right iliac fossa with a palpable tender caecum have been observed in five women from time to time. Acute pain in the left iliac fossa with a tender, palpable, contracted pelvic colon has been similarly observed in seven. Two patients have repeated attacks of severe pain in the left hypochondrium, with vomiting and prostration lasting from 6-48 hours. Four patients, two men and two women have attacks of severe epigastric pain which as a rule, come on at night shortly after the patient has fallen asleep. Immediately following the

onset of the pain there is a feeling of suffocation, accompanied by dyspnoea and palpitation. This lasts for 20-30 minutes when relief is obtained with the eructation of gas and a little of the stomach contents.

Far more commonly the chief complaint is of some abnormal sensation continuously present. The commonest is a dragging sensation, either in the epigastrium, in one or both iliac fossae, or in the umbilical region. In the majority this is accompanied by a constant ache in the lower lumbar region, or over both sacro-iliac joints. In fact, it appears to me that in many of these cases there is an actual relaxation of the sacro-iliac joints, since frequently greater relief is obtained by a firm sacro-iliac support than by the usual abdominal belt. Next to a "dragging", is a burning, boring, or tearing sensation along the line of the colon, quite independent of an actual attack of membranous colitis. With the onset of the latter, true colicky pains supervene, though not infrequently large masses of membrane may be passed without any colicky pains being present. Finally, the patient may complain of a sense of burning or itching, not located in the abdominal cavity but under the skin. As I have already remarked, the sensations are described largely in terms of the imaginative powers of the individual, but on final analysis they fit into one or other of the above classifications.

It is very difficult to explain on a physiological basis the pains and abnormal sensations complained of by these patients. In fact our knowledge of visceral sensibility is very incomplete and in the case of the gastrointestinal tract, "it is not clear whether powerful peristaltic waves alone give rise to pain or whether stretching of the hollow viscus is adequate too. As a rule, of course, the two phenomena are associated together". (S.Wright Applied Physiology Lond. 1926 p. 110). Now in these cases powerful peristaltic waves are absent, at least in anything like the degree observed in organic obstruction. It is true that a distended caecum or sigmoid loop is frequently detected, but gentle palpation, as a rule, causes the distended segment to empty itself without producing any relief of the pain. Mackenzie's theory of an irritable focus seems the best explanation so far offered. He assumes that if abnormal impulses constantly enter a certain region of the spinal cord it becomes modified in some unknown way so that the intensity of any impulses entering it becomes increased. The extent to which the sensations vary under emotional influences suggest that these regions in the cord may be influenced also from above. In severe cases the threshold of sensibility appears to be so low that the individual becomes aware of normal gastrointestinal movement. Any sensation of which normally we are unconscious invariably carries with it an unpleasant feeling tone

when it enters consciousness. This unpleasant feeling tone may in time influence the spinal segments and make them so irritable that sensations from the viscera, which would cause in a normal individual nothing worse than a vague discomfort, produce in these patients the severe pain and discomfort of which they so bitterly complain.

The fact that no two patients describe their sensations alike suggests their interpretation rests more on a psychical than on a physical basis. On the other hand, where there is a well recognised physical basis, as for example peptic ulcer, the description of the pain is remarkably consistent from case to case. Finally, opium which so readily relieves organic pain before its sleep producing effect comes into action, is singularly inert in relieving these individuals. As in most cases of psychical distress, small doses make them more excitable, and large doses send them to sleep with the pain persisting to the last moment of consciousness.

FLATULENCE

Although the presence of an abnormal quantity of gas in the stomach and intestine may be associated with one or other of the above-mentioned pains, it is not necessarily so. A patient may complain of a feeling of extreme distension without feeling any particular pain, even when the abdomen is visibly distended. Except for its association with pain in

the right iliac fossa or epigastrium, flatulence chiefly incommodes by the necessity for constant eructation, or by its passage per anum or by borborygmi. In those able to get about the accumulation of gas may interfere with the wearing of corsets etc. All these manifestations of flatulence are very noticeably produced by emotional upsets rather than by any dietetic or other indiscretions. Even in their severer forms they rarely last longer than a few days at a time. In three patients with excessively thin abdominal walls and marked separation of the recti, visible peristaltic movements of the small intestine and continuous eructation of gas from the stomach can be produced and maintained by lightly palpating the abdomen.

CONSTIPATION

If we accept Hurst's definition that it is a condition in which none of the residue of a meal, taken eight hours after defaecation, is excreted within forty hours, constipation was present in every one of this series. None of them were able to obtain a natural bowel movement without assistance. In 32, including all the males, the delay was definitely at the lower end of the colon, either above or below the recto-sigmoid apparatus. In 20 of these, not only did X-ray examination shew no delay elsewhere, but the bulk of the bismuth meal was evacuated within 24 hours. In the remaining 12 there was a delay of the meal in the rectum longer

than 24 hours, but the bulk had left by the end of 48 hours.

This observation tends to support the view of many radiologists that the bismuth meal has a very definite laxative effect. All these patients were very intolerant of a failure to secure a daily bowel movement. Such failure was immediately followed by the onset of the so-called toxaemic symptoms; these disappeared at once with a satisfactory evacuation. Such individuals are inclined to inspect closely their evacuations, and unless they are satisfied with the character and quantity passed, they become distressed in mind. Five claimed to notice their skin grow muddy if longer than twenty-four hours elapsed without a satisfactory evacuation. In contradistinction to this group, nine shewed but little accumulation in the rectum, even after several days had elapsed without an evacuation. In these cases an enema would bring away a quantity of small, discrete, hard nodules.

It appears likely that this nodule formation takes place throughout the length of the colon by excessive absorption of moisture, the result of a true colonic stasis. Yet X-ray examination failed to reveal any delay in the passage of the opaque material through the colon. The members of this group presented no "toxaemic" symptoms and were perfectly definite that they felt much more comfortable when the bowels did not act. In fact,

an action was always associated with a feeling of faintness and a sense of irritation along the line of the colon. They seemed to be torn between the comfort they secure by not having the bowels opened, and the greater discomfort they will experience the longer they delay in securing an evacuation. A delay in these individuals is always associated with much mucus accumulation round the hard nodules, probably the result of a true colitis from the irritant action of the dry hard faeces on the intestinal mucosa. Such patients are very intolerant of purgation or even roughage in the food. A purgative either produces severe griping and no evacuation, or else a succession of painful, watery stools, which fail to remove all the hardened nodules.

Yet, strangely enough, emotional stimuli often secures for them a satisfactory evacuation. Three of them are quite definite that the only time they have a natural bowel movement is on the day they expect a visit from their medical attendant. This form of constipation does not appear to be a sequel of the former, but a form, *sui generis*, which once established requires a daily enema for its successful treatment. It is possible to recognise the condition before it becomes permanent, whereupon the institution of a bland non-irritating diet and the administration of sedatives will often save them from the enema habit.

Apart from these four cardinal symptoms, all the individuals in this group display other departures

from normal functioning which in their order of frequency are as follows:-

(1) FIBROSITIS, MYALGIA, MUSCULAR RHEUMATISM.

Although "rheumatism" is an extremely common condition amongst the general population, and not limited to any one section of the community, it seems to be especially severe and persistent in the chronic intestinal invalid. Of the 41, all suffer from it, not only in the form of definite acute attacks but also as a continuous discomfort which never leaves them, and which responds to atmospheric changes so accurately that many patients regard themselves, not unjustly, as veritable barometers.

A particular distressing form is a severe aching behind the eyes with a sensation as if the upper lids were firmly retracted. The intercostal, pectoral, and occipital muscles are rather more frequently the site of pain than in a similar number of cases without intestinal symptoms. Those with the most persistent occipital fibrositis complain of tinnitus, which waxes and wanes *pari passu* with the fibrositic pain. This suggests the possibility of a fibrositis of the small muscles of the ear being the cause of the tinnitus in these cases.

(2) SUSCEPTIBILITY TO CATARRHAL INFECTIONS

Not only do these patients appear to be much more susceptible to the catarrhal affections of winter and spring than normal individuals, but they may pass through several attacks in succession during

the one season. Each attack is characterised by high temperature and great prostration with a total absence of physical signs or complications. Strangely enough, during such attacks, their intestinal symptoms recede into the background, and it is only with the establishment of convalescence that these reassert themselves.

(3) PYREXIA

About one-quarter of this series runs, from time to time, a mild pyrexia of 99-100 F., commencing and subsiding without any known cause and without any obvious association with particular symptoms. In none of these has repeated examination succeeded in revealing a tubercular or other focal infection. One patient who died of acute miliary tuberculosis never presented this type of pyrexia. Another quarter has a temperature curve subnormal in type and without the daily fluctuations of health.

(4) DIGESTIVE DISTURBANCES

The appetite appears to be less disturbed than would be expected from the severity and persistency of the abdominal symptoms. There is no true anorexia apart from deliberate exclusion of certain articles of food believed to be the cause of the intestinal distress. This exclusion, by the way, may be carried to such lengths that a bare subsistence diet is finally reached. But in the majority, the appetite remains surprisingly good throughout.

Attacks of "indigestion" occur but the patient as

a rule does not associate them with any cause other than the state of the bowel. Investigation, however, seldom fails to reveal an emotional disturbance as the true cause of these attacks. Similarly, when a particular article of food is strongly stressed as a cause of stomach symptoms, an emotional factor is invariably found to be associated with that article in the mind of the patient.

Stomach symptoms, when present, differ from those of organic disease chiefly by the extreme variability they display in relation to food, time of onset, method of relief, etc. When once invalidism has become established, true stomach symptoms tend to recede into the background, although in three-quarters of the patients no longer troubled by "indigestion", the original symptoms at the onset were definitely confined to the stomach. In only a quarter did bowel symptoms predominate at the beginning. In the early stages attacks of vomiting occurred, but later this tends to disappear. A furred tongue was present in only three-quarters of the cases; in only three of these was there a disagreeable odour from the breath. Recurrent herpetic eruptions of the buccal mucosa occur in six, the stomatitis neurotica chronica of Jacobi.

(5) MUCCO-MEMBRANOUS COLITIS

Every one of the forty-one cases have had at some time or other attacks of acute abdominal pain associated with the passage of mucus. Only in three,

all women, do these attacks still recur with any degree of frequency. One has an attack about every six weeks, while the other two usually have an interval of three to four months between each. Half of the cases have had intervals of one year, while in the remainder they are still longer. In only five cases were these attacks prominent at the onset of symptoms. In the majority they did not commence until the other symptoms had been established for a period of twelve to eighteen months.

(6) VASOMOTOR SYMPTOMS

All these patients present a very definite instability of the vasomotor system. Attacks of tachycardia and palpitation are very common. Cold hands and feet, with attacks of blueness and tinglings in the fingers and toes, are equally common. Attacks of vertigo, dizziness, and flushing also occur apart from the climacterium, and they are frequently brought about by a sudden movement from the reclining to the erect position. Attacks of paroxysmal rhinorrhoea occurred in five, and of typical angioneurotic oedema in two.

Apart from these two patients with attacks of oedema occurring in the classical positions, no less than ten others have attacks localised to the orbital region with discolouration of the skin affected. At one time it assumes the guise of an acute inflammatory process affecting both the lids and the circumorbital tissues. After a few days the bright

red colour alters to a reddish blue, and in some to a definite "black eye" before the condition completely subsides. At another time it may remain bright red throughout, or finally it may appear reddish blue or bluish black from the beginning. One attack usually lasts ten days and weeks or months may elapse before another occurs. More rarely there may be a series of attacks in succession, a fresh one developing before the previous one has completely subsided.

The remaining symptoms observed in this group may be summarised briefly. Delayed puberty, menstrual irregularities, dysmenorrhoea and a persistent leucorrhoea was found in no less than 95% of the women. Yet ten patients who suffer severely from dysmenorrhoea obtain complete relief from their constipation during menstruation. Three of these patients have typical attacks of membranous dysmenorrhoea, passing at times complete casts of endometrium.

Pyelonephritis due to *B. coli* infection occurred only once in this series. If, as it is generally assumed, infection of the kidney is via the bowel, pyelitis ought to be much commoner in a group of intestinal invalids than in a control group. On the other hand, what is more likely, disordered bowel function is probably no index of an increased infectivity or virulence of the intestinal organisms although, as Dudgeon shews, it may be accompanied by an increase in their number.

Attacks of asthma replaced abdominal symptoms from time to time in two men and five women. True migraine was present in five women. Tinnitus was a troublesome symptom in as many as twenty women but only two present the signs of otosclerosis. Insomnia of a more or less severe degree was complained of by 75%. The remaining 25% state they never can secure a "natural" sleep; that is, they claim to be either very restless, or else sleep so heavily as to awake "dazed" in the morning.

Eight of these patients are troubled from time to time by "fugues". They waken up at night feeling that everything is unreal. At first mildly interested, the patient quickly becomes alarmed and tries to call out but cannot utter a sound. Neither can she move a muscle to convince herself that she is "alive and not dead" as many put it. To the patient, the condition seems to last for hours but it is obviously impossible to obtain precise information on this point. In one patient, who had attacks in the day time, I was able to time it and found it lasted about thirty-five minutes. During this time the patient lay in a trance-like condition but from her statements after the attack had passed was conscious of all that went on. These attacks are not confined to severe degrees of intestinal invalidism since they were present in five of my second group of cases. What is common to all the patients experiencing these attacks is the existence

of severe mental conflict. This suggests that they really represent a dissociation syndrome.

PHYSICAL FINDINGS

BODY BUILD

When I became first interested in the chronic intestinal invalid, I had assumed that an asthenic build was a sine qua non for the diagnosis. But before reading the more recent literature on the relationship between body build, visceral position, and gastrointestinal function, I was satisfied from clinical observation that no necessary relationship existed between symptoms and habitus. Chronic gastrointestinal malfunctioning is met with nearly as frequently in the hypersthenic, and certainly in the sthenic, as in the asthenic individual. On the other hand, what is brought out by a review of the 41 cases is that the degree of invalidism bears a certain relationship to the build. Of the five men, one was hypersthenic, one sthenic, and three asthenic in build. Of the thirty-six women, only seven presented the classical figure of the visceroptotic habitus of the virginal type, and in only three that of the maternal type. Of the remaining twenty-six, twenty differed in no way from the average standard, while six were definitely hypersthenic in build.

As regards invalidism and the amount of incapacity resulting, the three asthenic men, the seven asthenic women of the virginal type, and two of the hypersthenic type, very definitely shewed a much

greater degree than the remainder. This suggests that while all types of body build may suffer from gastrointestinal malfunctioning, invalidism tends to be more severe and more persistent in the asthenic.

RADIOLOGICAL EXAMINATION OF THE GASTROINTESTINAL TRACT

All these individuals have had radiological examinations at one time or other. On comparing the present clinical condition of each with the radiograms taken some years previously, it is clear that the latter were of value only in a negative sense by helping to exclude organic disease.

This is what is to be expected from a consideration of the more recent work which has revolutionised the time-honoured conceptions of the form and position of the abdominal organs. Several of the cases, whose original radiograms shewed the hollow viscera considerably displaced from what was considered the normal, have responded much better to treatment than those whose radiograms not once, but several times, had shewn the viscera to be well within the limits of normality.

None of them shewed any delay in the onward passage of an opaque meal. The times of stomach emptying were as follows:-

	<u>Male</u>	<u>Female</u>
Empty within 2 hours	2	5
" " 3 "	2	30
" " 4 "	1	1

It is to be noted that in the seven cases with quickest emptying time epigastric pain and distress were more pronounced and persistent than in the others; this suggests that the normal "hunger" contractions, on account of a lowered threshold of sensibility, tend to rise to consciousness and to be interpreted as abnormal sensations. Also, in the remainder of the tract no delay was observed; even the most pronounced cases of rectal constipation had evacuated the bulk of the meal in 48 hours. Only in the nine cases, of what might be termed fragmentary constipation, was residue left in the rectum longer than 48 hours and in one case was detected still there a week later.

THE SECRETORY ACTIVITY OF THE STOMACH was within the range of normality in one male and twelve females. Three males and fifteen females shewed hyperchlorhydria, one male and eleven females hypochlorhydria.

Of nine females, whose symptoms at the onset were typical of clinical hyperchlorhydria, four shewed a high acid curve, three a normal curve and two a subnormal curve. In all, the stomach symptoms have tended to fall into the background or disappear.

OTHER FINDINGS:

(1) CARDIOVASCULAR

In none of the cases is the systolic blood pressure at present above 120 mm. Hg. In 3 males and 10 females it lies between 100-120 mm. Hg., and

in 2 males and 26 females it is under 100 mm. Hg.

If we assume the average pulse pressure in health to be 40 mm. Hg., the most constant finding in all these cases is a pulse pressure which never exceeded 30 and usually lies somewhere in the neighbourhood of 20. The lowest pulse pressures are found in those who complain much of feelings of faintness and sinking in the epigastrium.

(2) GENITO-URINARY

The right kidney is palpable in two men and fifteen women and both are palpable in seven females. In none is the left kidney alone palpable.

In the severe cases, all unmarried females, the genital organs shew some degree of infantilism.

(3) INTEGUMENTARY

Pigmentation of the skin, upon which Lane lays so much stress as a symptom of chronic intestinal stasis, was absent in all the worst cases. On the other hand, the most severe degree of pigmentation, almost amounting to that met with in Addison's disease, is to be observed in two women whose general symptoms and degree of constipation are the mildest in the series. What is present in all the severe cases is a complexion which might be likened to a very dirty chalk-white. In none is hyperidrosis prominent or troublesome.

The most interesting skin lesion common to these cases is a special form of paronychia which develops independently of trauma or obvious infection. It is

of a chronic relapsing type as a rule, with a painful red swelling of the tissues around the nails, rarely going on to pus formation. The nail has an eroded appearance suggestive of ringworm, but microscopic examination has been always negative. In two cases all the fingers were affected. More usually only one or two on each hand shew the condition which occurred in thirty-two others; fifteen of these belong to Group 11. In two in which only one finger was affected I removed the nail in the hope of preventing its further development but without success; a finger on the other hand was attacked several months later. Local treatment seems of little avail since the condition tends to disappear with the individual's general improvement and to recur with a relapse in the general condition, irrespective of the treatment adopted. In severe cases the fingers never become completely healed, but in the less severe they appear quite normal in the intervals between attacks.

(4) OTHER SYSTEMS

Enlargement of the thyroid is to be seen in five women. Metatarsalgia was present at one time or other in no less than thirty of the women and in the two asthenic males: in all it was relieved by suitable supports after the failure of exercises.

GROUP II

I now pass on to consider the second group

consisting of 15 males and 96 females seen by me when their symptoms first compelled them to seek advice. Instead of analysing this group on similar lines to Group I, I propose to review these patients as a problem in diagnosis and finally to utilize both groups for some remarks on the genesis, evolution and treatment of the condition.

Since most writers on the subject of chronic intestinal invalidism deal with the condition as if it originated not before adult life, some explanation is desirable why children are included in my figures.

In a previous section the suggestion was made that there is a certain amount of evidence for regarding the chronic digestive disturbances of infancy, childhood, and adult life as different age manifestations of a common underlying cause. By tabulating the symptoms in the order of frequency with which they present themselves before puberty, and by similarly dealing with them as they appear after puberty, further support is obtained for this suggestion.

<u>Before Puberty</u>		<u>After Puberty</u>	
<u>34 Cases below 14 yrs.</u>		<u>77 Cases above 14 yrs.</u>	
<u>of age.</u>		<u>of age.</u>	
<u>9 males 25 females</u>		<u>6 males 71 females</u>	
Wasting	90%	Constipation	85%
Loss of appetite	90%	Abdominal discomfort	75%
Colicky pains in the abdomen	85%	Flatulence	75%

cont. Before Puberty34 Cases below 14 yrs.
of age.9 males 25 females

Nervous symptoms	75%
(irritability, sleep- lessness, night terrors)	
Attacks of pallor	66%
Loss of energy	60%
Constipation	33%
Vomiting	10%

After Puberty77 Cases above 14 yrs.
of age.6 males 71 females

Loss of energy	70%
Wasting (loss of weight)	40%
Headache	35%
Insomnia and Depression	25%
Nausea	15%
Loss of appetite	12%

If we tabulate the commonest associated signs
we find:-

Before Puberty

Excess of mucus in the stools	98%
Sallow ("pasty") complexion with dark rings round eyes	90%
Puffiness under eyes	90%
Distended abdomen	75%
Amyotonia	70%
Furred tongue	50%
Cold extremities	35%

After Puberty

Sallow complexion ("pasty")	70%
Cold extremities	65%
Furred tongue	60%
Tender abdomen	52%
Offensive breath	30%
Amyotonia	25%
Distended abdomen	10%

It is at once obvious that there is a striking
similarity. The symptoms and physical signs are
identical for both and only differ in their
incidence per cent. This seems to be due chiefly

to the metabolic differences between the child and adult, and to the absence of auto-suggestion in the former. Since childhood is a period of rapid growth any interference with the utilization of food material is at once reflected in the weight curve. Moreover, the greater instability of the nervous and vasomotor systems of the child make them more responsive to even slight disturbances in the body economy. On the other hand, we see the ready auto-suggestibility of the adult reflecting itself in the prominence given to constipation and abdominal pain, both of which are associated in the lay mind with grave consequences. Also the greater variations in the adult's experience of life tend to make symptoms somewhat different from one case to another, whereas in the child they tend to run true to type from one individual to another.

A striking difference between the children and the adults is the very high incidence of mucus in the stools of the former. In the child, a stool which shews no gross particles of membrane, if shaken up in water and the liquified faecal material drawn off, will be found to have had a large quantity of mucus present. Yet I have never seen a typical attack of muco-membranous colitis in a child. The colicky pains in children may be accompanied by little or no mucus in the stools, or the pains may be absent when the mucus is abundant. In the adult on the other hand, it is only after other symptoms have been

present for a considerable length of time that mucus begins to appear. This is generally present in excess for several months before typical attacks of colitis occur. Only five cases in my second group had attacks, and in two they were the first symptoms to appear. In the other three, they developed notwithstanding the fact that the patients were under treatment at the time, and in all they were very definitely dependant upon emotional influences. Little need be said of the physical findings since these were chiefly negative.

In the relationship between habitus and symptoms certain differences were noted in the cases before and after puberty. In the cases before puberty, Seham's findings were corroborated in that these children were all on an average 2" taller, 5" less chest circumference, and 4 lbs. under weight, compared with a normal child of the same age. No such uniformity was discovered in the adult group. Of the 77 adults, only 10 were of the definite asthenic habitus; 15 were definitely taller than the average height; 15 were of a definite pyknic habitus; while the remaining 37 in no way differed from the average standard. As regards blood pressure, this tended to be uniformly below the average for the age in each child in the cases before puberty. In the adults, in 2 males, and in 10 females with an early menopause, hypertension was present; 4 males and 40 females had pressures within normal limits for the age period,

while the remainder shewed hypotension. Palpable kidney was present on the right side in three children of the ages 11, 12, and $12\frac{1}{2}$ years, and in ten of the women. In three women the kidney was palpable on both sides. It was palpable in only one adult male and on the right side. The secretory curve of the stomach was determined in 2 males and 8 females, all adults, chiefly for the satisfaction of the patients. In none did the curve exceed the normal limits.

DIAGNOSIS

When after the most careful physical examination, repeated at intervals with the assistance of laboratory and radiological methods when necessary, the findings remain negative, the diagnosis suggests itself. Yet there tends to linger in the mind of the physician a doubt that, after all, some underlying organic condition may have been missed, an occult tuberculosis, or a neoplasm, etc. This doubt serves a useful function if it ensures an attitude of vigilance to detect early any lesion which requires specific treatment, medical or surgical. But nothing is more fatal to the interests of the patient than to betray, by manner or speech, this state of mind. Having reasonably satisfied himself of the absence of organic disease, the physician should proceed to base his diagnosis in each case on a consideration of the interplay of three factors, the medical, the social, and the mental.

The medical factor will have been already partially disposed of in the routine physical examination. In many of these cases medical abnormalities are to be discovered of trifling significance in themselves. When these produce a reaction out of all proportion to their importance they afford a suggestive clue to the kind of individual with whom one is dealing. Early flat foot, hypertrophic rhinitis, and occipital fibrositis may be taken as examples of what is meant. Symptoms connected with these may so dominate the clinical picture that it is only when they are relieved that the underlying general malfunction becomes evident.

Far greater in importance is an investigation of the social factor. Even in the child this factor is not an unimportant one. Severe cases of chronic intestinal indigestion are but rarely met with in the homes of intelligent parents. They almost invariably develop in the environment of faddy, over-anxious, and semi-invalid mothers where only too often faulty food adjustment, faulty mental adjustment, and active suggestion of ill-health are conspiring together against the healthy development of the child.

These factors have to be investigated in their bearing on the symptoms presented by each individual case. In the adult, the most important social factor is that of the "square peg in the round hole". It may be that the individual's work is excessive for his particular constitution, that by monotony, by the

responsibility it entails, and so on, it is making demands that cannot be met. Defective parental and marital adjustment may be adding their quota towards the production of symptoms. Some carefully guarded secret, the nucleus of a state of fear or conscience, may require careful probing before its etiological significance becomes manifest. It is not until the social factor has been carefully explored, can all its ramifications into the mental and physical life of the patient be even guessed.

Perhaps of greatest diagnostic importance is the patient's type of mental make-up. The most characteristic finding is a constant over-reaction to stimuli of all kinds. In children it displays itself in fretfulness, easily disturbed sleep, night terrors, readiness to weep on the slightest provocation, inability to keep still, incoordination of movements and habit spasms.

In the adult, we may find inability to concentrate, capricious appetite, disturbed sleep, nightmares, over-responsiveness to joys and sorrows, excessive sensitiveness to imagined harshness and insult. The assumption of fictitious cheerfulness often displayed by these patients while they are describing their attacks of palpitation, praecordial pain, abdominal discomforts and so on, tend to throw the casual observer off the track, but is very suggestive to one who is persistent enough to penetrate below the surface. More generally

however they describe their symptoms in excessive detail, and emphasise the intensity of their sufferings by the use of such expressions as "agonizing" and "intolerable". This is accompanied by a characteristic querulous note in voice and manner. Finally the medical history of the individual, literally from the cradle, requires to be carefully reviewed for its prognostic as well as its diagnostic import.

The earlier malfunction manifests itself, and the more frequently the symptomatic attacks occur the less likely is the patient to succeed in satisfactorily adjusting his or her life. From the diagnostic point of view such a history reveals better than anything else what kind of an individual one is dealing with, and how he will continue to react mentally and physically to his environment. Similarly due attention should be paid to the types of stress and strain which appear to determine the onset of symptoms. The result of such an investigation may be illustrated by summarizing the early history of the individuals comprising my first group. In this it was possible to secure independant or confirmatory evidence from outside sources.

Of these, one male and nine females were the youngest of a large family born near the end of the reproductive life, but of healthy stock with healthy brothers and sisters. Two males and fifteen females were the offspring of ailing parents whose brothers

and sisters had died in early life, or who were still alive but in indifferent health. Two males and eleven females were only children whose mother had "never been the same" after the patient's birth. Without a single exception, they all had been difficult to rear until past infancy. From five years of age onwards, four males and thirty females were said to have shewn "weakness", "anaemia", or "threatened" consumption. Circumstantial evidence suggests that the condition described in such phrases was really one of chronic intestinal indigestion. The majority improved in health after the ninth year, by which time they had passed through the gamut of the usual infections of childhood, each of which they had experienced in a severe form. In all the females the onset of puberty was stormy; dysmenorrhoea, irregular menstruation, severe emotional disturbances, difficulties with school work, and insomnia were the rule. After a prolonged puberty, in five cases these symptoms gradually passed away, and a period of several years elapsed before the development of intestinal ones occurred. In twenty-two the puberty symptoms continued with some improvement, until marriage, when they were gradually replaced by the intestinal ones. In eight, which includes all the individuals of pronounced asthenic habitus, intestinal symptoms appeared along with those of puberty and there rapidly developed an intestinal invalidism which has lasted ever since.

The influences of marriage revealed itself as follows. The only married male suffered from "dilated stomach" after getting engaged, and this necessitated a postponement of his marriage. Another attack occurred after marriage, and now a third, a somewhat severe one, has followed upon the birth of his first child. He is never "really well" in the intervals. Of the women, four are single, ten married with no children, seventeen with one child, and five with two or more children. Four of them were "not strong" when they married; six commenced to ail in the first year of marriage. The seventeen with one child all state they have "never felt the same" since the birth. Of the five who have had more than one child, four started symptoms in a mild form after the second child. These got worse with each subsequent pregnancy but never reached the severe or persistent type met with in the other cases. If there was anything in the theory that repeated pregnancies, by weakening the abdominal wall and bringing about a dropping of the viscera, are a casual factor in the production of this condition, these five cases should be the severest in the series instead of the mildest. Moreover, examination of an unselected number of healthy middle-aged multipara from an industrial population strongly negatives this view. Many of these will be found leading healthy strenuous lives, notwithstanding tissue-like abdominal walls, with a retracted epigastrium and a bulging

hypogastrium. This seems sure proof of what little importance the abdominal musculature and the position of the viscera, per se, play in the genesis of symptoms.

The thin, flaccid wall of these healthy women lends itself to easy palpation of the abdomen. The toneless abdominal wall of the chronic intestinal invalid, on the other hand, frequently makes examination very difficult on account of its readiness to fly into spasm from the slightest stimulus.

Of the eight whose symptoms had followed on from the disturbances of puberty, two had been in constant conflict with a mother-in-law, four had experienced a prolonged struggle between an intensely emotional nature and sexual ignorance, while two had been in conflict with an imperious father.

Of the ten with no children, four had an intense fear of pregnancy, four had married in sexual ignorance and were anaesthetic, and two had unsatisfactory husbands. Of the seventeen with one child, fifteen had had a long and difficult labour and dreaded becoming pregnant a second time. In the other two labour had been easy, but a prolonged period of strain had followed in nursing a marasmic infant. Of the five multiparae, the number of children were respectively 5, 3, 6, 4, 4, and it was only after the birth of the last child that symptoms became sufficiently pronounced to compel the patients to seek medical advice.

Varied factors appeared to determine the onset of symptoms at this time; fear of more children, the children becoming "more trying" as they grew up, fear of losing their husbands' affections and such like, seemed to be common factors.

Of the two types of mental reaction which may be displayed by the intestinal invalid, the fictitiously cheerful, and the querulous introspective, two single men and six married women were of the former type while all the remainder were of the latter.

Five women of the "cheerful" group were of a very severe type and one had only to observe them from week to week to realise how much useful work they had performed in spite of their invalidism. Yet it was obvious they differed from the normal in several respects, particularly in possessing a most exaggerated sense of duty. They are of the type referred to by Albutt (9) as self-effacing, uncomplaining, and of such high ideals that they are forever lamenting, with a wan smile, that their symptoms prevent them from doing all they would like to be able to do in the service of others. Of the querulous introspective type, all had apparently possessed a strong egoism which early found itself in violent conflict with a physical deficiency plus an overpowering environment. A certain few of these patients find an adjustment between their ego demands and their ineffectiveness as long as they are shielded from any excess of environmental pressure.

The majority, however, succumb to the slightest pressure, and instead of being able to make any adjustment they seek refuge behind their symptoms, and obtain by sympathy the power and dominance denied them by their own ineffectivity.

I do not propose to discuss the differential diagnosis of this condition from the well established organic disorder. This is considered fully in all the standard text books and I have little to add from my own observations. There is no reason why an organic condition should not develop in the chronic intestinal invalid, and it is often difficult to make certain that a patient in the early days of observation has not an organic lesion. Yet in all the years these forty-one cases have been under observation no organic lesion has ever been detected.

My own observations agree with the teaching of the Leeds School of Surgery which stresses the importance of the clinical history. This, along with a careful general clinical examination, is probably of greater value than all the other methods of investigation so far devised. The present position of chronic appendicitis has been already discussed. As regards the gall bladder, it is possible not only to make certain of the presence or absence of stones by radiology, but even to determine its functional integrity by cholecystography. In fact the very success of the latter method has already led to meddlesome surgery. Martin (420), Muller(475)

and others, dissatisfied with the results of removal of the non-calculous gall bladder for the cure of vague gastrointestinal symptoms, find the evidence far from conclusive that "a very slight infiltration of the gall bladder wall and a lipoid deposit in the mucosa can cause acid indigestion, a feeling of fullness in the epigastrium, flatulence, and intermittent pain".

As regards the mimicry of duodenal symptoms Irving Gray (246), from an analysis of 250 cases of suspected duodenal ulcer, found that 41% were due to tobacco smoking, 23% to chronic gall bladder disease, 18.2% to constitutional inferiority, and 17.8 to a variety of conditions; these figures justify one in hesitating before labelling every case of delayed pain after food as a case of peptic ulcer.

One wonders how many of these cases of chronic gall bladder disease were of the type already referred to in which surgical interference failed to remove the symptoms. There is only one manifestation of chronic intestinal invalidism which may make the physician hesitate to wait, and that is where an exacerbation of symptoms closely resembles an attack of acute appendicitis. Even in such a case, a normal or subnormal leucocyte count should fortify the surgeon in withholding his hand. Needless to say I exclude the overwhelming toxic case with a leucopenia. Here the patient is so obviously ill with an intra-abdominal catastrophe that the course of action is

at once obvious without embarking upon the refinements of a differential diagnosis.

Finally, the late results of surgery in these cases may be briefly summarized. Of my forty-one cases none of the males underwent any surgical procedure. Amongst the females, the following procedures had been tried in twenty-five before they came under my observation.

APPENDECTOMY 25.

Of these twenty stated they were no better for the operation, four were improved, and one decidedly worse.

CAECO-COLON FIXATION 16.

All were improved for six months to a year, after which the symptoms returned worse than before.

HEMICOLECTOMY 10.

Of these, two very much improved, seven no different, and one worse; in all the constipation persisted.

GASTROPEXY 4.

All these stated a marked improvement was noted for about nine months. Then in all, the symptoms returned worse than before.

UTERUS FIXATION 2., KIDNEY FIXATION 3.,

GASTRO-ENTEROSTOMY 3., all without any improvement.

Three cases had each an appendectomy, a hemicolectomy, and finally a gastropexy performed without relief. The caeco-colon fixations were done after a previous appendectomy in seven. The present state of the twenty-five who underwent some form of

surgical interference is to-day very much worse than that of those who escaped it, although the notes suggest that the latter's symptoms were just as disabling in the early stages as those of the former. These figures corroborate the impression already obtained from a study of the literature, namely, that nothing is more disastrous than surgical intervention in the chronic intestinal invalid. As a method of treatment, it is useless; as a method of diagnosis, it is criminal.

TREATMENT

My remarks will be confined chiefly to the treatment of the condition in the adult. Chronic indigestion of the child is adequately dealt with in all the standard text books with a uniformity unusual in medicine, and will be touched upon here only in a few of its aspects.

The first step in the treatment of the chronic intestinal invalid is to secure the confidence of the patient by a thorough, but not excessive, general medical examination. Hutchinson (309) is right in stressing the harm done to these patients by the modern "clinical team" method of investigation. When the clinical findings turn out to be negative, the greatest care, tact, and sympathy are required in explaining to the patient how genuine distress and real ill-health may exist in the absence of a definite disease. If the meaning of a negative finding is not explained tactfully to these sensitive

individuals they immediately suspect that the physician thinks there is nothing the matter with them, and at once a barrier is raised which prevents any further investigation of their mentality.

Suitable to the intelligence of the patient, analogies from every-day life may be employed to shew how a disturbance in function may often produce far more serious disablement than a change in structure. This will naturally lead to an explanation of how changes in body functions may be brought about.

The influences of heredity, constitution, environment, etc., may be lightly touched upon as a preliminary to investigating the life history of the individual. From the latter may be selected facts which suitably illustrate the explanations already given. If this is done, the patient is in a better position to appreciate the rationale of the treatment suggested and to co-operate intelligently. A certain degree of dogmatism is necessary, but the physician should make it clear that, while he is perfectly convinced of his findings at the moment, neither he nor anyone else can be equally dogmatic about the future, and that, should new symptoms appear or the old ones persist, further examination will undoubtedly shew what is wrong.

In the treatment of an individual case the chief objective is to increase the resistance to fatigue. Success will depend upon how far the patient is constitutionally capable of developing an increase in

resistance, how far the social environmental stresses may be altered, how far the mental reactions can be modified, and whether or not the gastrointestinal tract is capable of responding to direct specific treatment. These four factors are so intimately interwoven that failure with one and success with another do not mathematically balance, and the net result may fall far short of the object desired. Unfortunately, from circumstances entirely outside the control of the patient or the physician, one or other of these factors may be irremediable, and it is precisely for this reason that this class of patient is so frequently the despair of clinical medicine. These factors may now be considered seriatim.

(I) THE CONSTITUTIONAL FACTOR

If constitution represents the up-to-the-instant result of environment acting upon inherited factors, it is of necessity beyond our control, since we cannot alter the inherited potentialities. Yet since these potentialities frequently express themselves by reactions which achieve the dignity of pathological states, successful treatment of these states must of necessity lessen the total burden which these patients have to carry. In other words, general clinical examination may reveal conditions of little importance in themselves, and of no direct etiological significance in the production of gastrointestinal symptoms, yet of profound significance for the patient as a whole. The

summation of stimuli arising from a series of such conditions may so lower the threshold of sensibility that the slightest degree of gastrointestinal malfunction becomes intolerable. Obviously then, our first duty is to correct to the best of our ability all such conditions that we find. But a word of caution may be uttered here against excessive or meddlesome therapeutics. Removal of teeth or tonsils that are not clearly and definitely septic, attempting the impossibility of sterilizing the cervix uteri, and similar measures are to be severely deprecated. Abnormal modes of reaction like asthma, paroxysmal rhinorrhoea, vasomotor disturbances, are best left without direct treatment. In these cases the attacks tend to lessen, *pari-passu*, with the general improvement. A certain number of conditions which are commonly found and which do require active treatment may be mentioned.

First and foremost on account of their direct effect on the abdominal viscera are anal fissures, and painful tags about the anus. These are often not mentioned by the patient and may require to be searched out. Nothing is more dramatic than the relief of general and intestinal symptoms which frequently follows the cure of an unsuspected anal fissure. Falling of the plantar arch is a very frequent accessory factor in the production of that "tired and exhausted feeling". It is obvious that continuously aching feet must induce a lack of energy

and inhibit any desire for exertion. Since many of these cases are so exhausted that exercises are out of the question, plantar supports must be worn until the general improvement is sufficient to permit the usual remedial ones. Possibly more commonly than is suspected, some of the abdominal pain and backache complained of may arise from lax sacro-iliac joints. A snugly fitting sacro-iliac belt is certainly of the greatest benefit in some cases. Strangely enough in my experience scoliosis is an unusual finding in adolescent cases. Far more commonly it occurs as an isolated phenomenon in otherwise healthy children. In one case in which it did occur it offered a very difficult problem for treatment since the child was neither able to tolerate a jacket nor persevere with the special exercises devised for it. Pruritis and pruritic skin lesions, so common in women, should receive immediate treatment and where possible, by a single dose of X-rays. The removal of such a source of irritation often rapidly advances the patient along the lines of general improvement.

Minor degree of astigmatism should be accurately corrected. Chronic hypertrophic rhinitis, or a deflected septum, if of sufficient degree to obstruct nasal breathing, requires treatment to restore the air way. But in patients the subjects of paroxysmal rhinorrhoea and asthma, the less local treatment given to the nose the better. Few, if any, of these patients will not, at sometime or other, ask

for a tonic. The feeling of exhaustion, tiredness, inability to think, etc., all suggest to the lay mind the necessity for something to "tone them up". While of course it is obvious that the harassed mentality requires sedative, and not tonic treatment, there are times when one is tempted to try one or other of the "tonic" remedies, strychnine, iron, arsenic, etc. In my experience these patients are very intolerant of such drugs. By mouth, they invariably upset the gastrointestinal tract: hypodermically, they have never appeared to me to do anything but harm since they grievously disappoint the patient who usually expects from them a magic effect which does not materialise.

(2) SOCIAL FACTOR

Just as man cannot choose his parents, so he cannot alter his birth environment. Most of these patients have been an only child of an ailing mother or the last born of a large and robust family. In the former case the child, often weakly from birth, has been brought up in an atmosphere of invalidism from which it cannot escape; in the other case, the child has invalidism forced upon it by the unwise attention of a mother, over-anxious for the child "who was the first to give her any trouble". Labouring under the defects of an inferior constitution, these children grow up impressed with their difference from other children. Surrounded as they are by healthy children they cannot avoid having

the feeling of inferiority continuously impressed upon the plastic, suggestible mentality of youth. Each case has to be judged on its own merits, but the physician may often secure, if economic conditions permit, suitable adjustment of these environmental defects, by tact and judicious advice. Later, school conditions require careful consideration. Many of these children are highly intelligent, over-conscientious and apply themselves intensively to their lessons. They tend to be amongst those who are "pushed" for the honour of the school, with disastrous results. At the first signs of fatigue, lessons should be cut down to a minimum and never allowed in excess of the individual child's ability to deal with them easily and comfortably. They tend to pass through a stormy period at puberty, when all the authority of the physician may be required to assure the parents that, with careful handling, nature will in time readjust itself.

The choice of a career probably requires the greatest consideration of all. One may say without fear of contradiction that at least ninety per cent of the cases which break down in adult life do so because they find themselves "square pegs in round holes". The remaining ten per cent do so because, ardently loving their work, they put more into it than they can possibly continue to supply. Unfortunately in many cases financial circumstances preclude a change, and often little can be done other

than to remove all burdens except those that must be borne. This applies specially to cases where marriage is the career which determines the breakdown. A real love marriage based upon a thorough understanding of sex life is the surest preventative of these serious maladjustments which so frequently express themselves in the most aggravated forms of gastrointestinal invalidism. For the fortunate few whose financial circumstances permit it and where the marriage tie is not a bar, a complete change of occupation, or the following of an occupation in more congenial surroundings, will often contribute largely to the success of other lines of treatment. This may be illustrated by the case of a very clever young woman who was trained for the teaching profession, and who was regarded by her colleagues as likely to be a brilliant success if her health would only permit. For five years she suffered from such indifferent health that she could not teach for longer than a few weeks at a time. After great opposition from her parents and others, she was induced to quit teaching and learn afresh secretarial work. For three years now, in her new occupation, she has enjoyed a state of health and well-being she had not known since her childhood days.

(3) THE PSYCHOLOGICAL FACTOR

It is held by many authorities that there is a type of mental reaction peculiar to chronic intestinal invalidism. This is only partly true

since no two consecutive cases are likely to present a similar reaction. What is found is that in these cases, no matter what the final reaction be, whether that of hysteria, anxiety, neurosis, etc., there is invariably present an inferiority complex which dates back to childhood. If the child has had ill-health dating from infancy, a state of anxiety tends to be engendered in the parents, which acts as a constant source of suggestion to the child that he or she is not as other children. This exaggerates and intensifies the natural inferiority which all children must feel in the presence of adults. As these children grow up, one of two things may happen. Some accept their inferiority and seek security, peace of mind, and social equilibrium by following the path of least resistance. Even the path of least resistance may produce a strain greater than a very inferior mentality can cope with. In such case no attempt is made to combat it, and refuge is sought in a state of uncomplaining invalidism. This tendency should be looked for in early life and counteracted by advising the parents to employ a little judicious neglect and let the child risk facing many of the things he is being guarded against so carefully.

Other children react differently. Unconsciously considering themselves neglected and discriminated against by both Nature and Mankind, they rebel against their fate. In childhood, this rebellion

displays itself by one or other variety of the "problem child", whose vagaries are so often put down to poisoning from his intestinal tract. The acute infections tend to attack the central nervous system in these children. There is evidence that chorea, for example, develops only in the type here considered. If they successfully weather these storms of childhood, they tend to be unusually bright and intelligent, and undertake tasks at school far beyond their powers. With the violent eruption of puberty temporarily paralysing their activities, every experience becomes interpreted as a defeat; they lose confidence in themselves and unconsciously seek solace in their physical symptoms as being an efficient cause and a satisfactory explanation of their failure. Obviously these children require a very careful grading of their school tasks, and a very efficient preparation for puberty, so that they may not be taken unawares by the physical and emotional changes they feel so intensely. Cases seen in adult life usually have acquired one or other of the neurotic reactions which obscures their inferiority complex. In them, the process of repression which is a normal accompaniment of healthy childhood development, has not succeeded in bringing about the sublimations that characterise mental health and harmony. Deprived partially of this indirect means of gratifying the primary instincts, the individual suffers more than normally from any accumulation of sexual tension that may

occur later. Abrupt introduction to sexual knowledge often of an erroneous type, or no introduction at all, may result in undue repression of the mental impulses which are struggling for recognition at puberty. The various inhibitions thus formed may hinder the ability to experience sexual satisfaction when a suitable opportunity presents itself in marriage. It is for this reason that so many cases come to grief in the first year of married life. With most other diseases, this specific agent, i.e. undue repression, may be present in many cases without causing symptoms; it all depends on the intensity or dosage, and the degree of adjustment possible for the individual. When the degree of adjustment is small and the repression is great, the conflict may reveal itself on the physical level by gastrointestinal malfunction. This may then react and make manifest a previously latent neurosis. In severe cases, the anxiety neurosis may be so intense as to completely obscure the true nature of the case. Such cases require a psychological analysis to resolve the neurosis before it is possible to deal with the underlying inferiority complex. Until the resolution is effected, no treatment of the digestive symptoms is likely to be effective.

These are the cases which pass from one medical man to another, always hoping for a relief they never obtain and never can obtain until they have had adequate treatment first for their anxiety.

It must be remembered that the more pronounced infantile types do not desire relief. Their inhibitions and repressions safeguard them from facing the realities of life and their physical symptoms safeguard them from any direct attack upon their mental repressions. In favourable cases, when the true causes of anxiety have been accepted by the patient, attention may then be turned to the adjuvant morbid agents.

It is remarkable what secret fears, worries and burdens these patients may be labouring under. Many of these are really insoluble. It is no use telling a patient not to worry when the cause of it be in some very genuine justifiable but irremediable situation. It may be profound marital incompatibility, overwhelming liabilities and responsibilities, wastrel children or many an other profoundly disturbing factor beyond the individual's control. The mental purgation which results from confiding these secret worries to a sympathetic ear often, however, clarifies the muddled mentality and permits a concentration on the main difficulties which was previously impossible when so much mental energy was being consumed by subsidiary and unimportant ones. Tactfully it should be pointed out to individuals who are handicapped by insoluble difficulties that mental peace can often be secured by acquiescing in things which cannot be cured. Still more necessary is it that the person, who has

started life handicapped by a defective physique or constitution, should learn the lesson of acquiescence and settle down as best he can with his handicap. For all who are devoting themselves to the fruitless search of a "cure" that will make them the exact replicas of normal individuals, the motto to guide them aright should be that "the conquest of Fate is not by struggling against it, nor trying to escape it, but by acquiescence".

(4) THE MEDICAL FACTOR

This involves the treatment of the main symptoms and the restoration of the individual to economic efficiency by directly increasing his resistance to fatigue. It is approached through four main channels, rest, exercise, diet and drugs, the last of which being the least important.

SPECIFIC TREATMENT

(a) REST

All these cases require some form of rest, but whether it should be rest in bed, rest from work, or simply cutting out extraneous activities can only be decided for each case on its own merits, depending on the severity of the symptoms and the individual's financial circumstances. It is futile to tell a breadwinner to take a holiday if he is to worry the whole time how the family fares on a diminished income, or the individual in a good position which, if once lost, is not likely to be replaced easily. Similarly with an individual for whom these

considerations do not count, over-work should not be exchanged for a holiday where the exertions of sport and pleasure add to, rather than diminish, the physical and mental exhaustion. Fortunately in many, by carefully investigating the daily habits of the individual, a little adjustment here and there, often results in securing a considerable degree of rest. Early to bed and early to rise secures a restful start for the day's work; where a man or woman can do so, an hour later to business in the morning, an hour earlier away at night, and an hour and a half for lunch instead of three-quarters, means a considerable period of rest when spread over several months. A little ingenuity on such lines often succeeds where, at first sight, there seems no possible relief from the wear and tear of the daily round. An essential desideratum in all cases is that they should secure adequate sleep. Since many of them dread having to take a sleeping draught, it is well to point out that the drug they are taking is not a narcotic but something to tone up the nervous system. The idea of a "tonic" treatment is always more acceptable to the lay mind than a sedative one. Dial or adalin 5-15 grs. is very successful in giving a restful sleep to many. In some however the effect only lasts a few hours and when they awaken they are unable to get off to sleep again. Such cases often do much better with a small dose of bromide after each meal and a final full dose of bromide and chloral at bedtime.

As they improve it is easy to drop out the daily bromide, then the chloral, and finally the nightly bromide. If certain individuals find they cannot do without something to take at bedtime, a small dose of bromide can be continued indefinitely without harm.

(b) EXERCISE

It is the fashion at the moment to lay great stress on the therapeutic effect of exercise in these broken-down individuals. The school of Goldthwait in particular promises results almost amounting to the miraculous. While fully realising the value of graduated exercise, I am impressed by the great harm done to many by the injudicious employment of them at a stage when the patient is not in a fit condition to benefit. In severe cases it is only after a preliminary period of rest that they can be expected to benefit. There is no hard and fast rule to decide when a patient is fit. One can only tentatively try with a very few exercises at a time, always stopping short when producing the slightest feeling of fatigue. In severe cases in which the period of rest is spent in bed, a course of general massage is a useful preliminary.

The form of exercise which I have found of most benefit is the simple, time-honoured one, as follows: with the patient on his back, each leg kept firmly extended is raised alternately to the vertical, then both legs together, and finally the body raised from the hips to the sitting posture with the arms

extended by the side, and the legs placed firmly against the floor. Each movement is done once, and increased by one each day short of producing a feeling of fatigue. If this is produced, the number of times is dropped by one and continued at this number until the patient no longer feels tired. Along with it, a simple breathing exercise is ordered. With hands on hips, head thrown back and chin well down, the patient rises slowly on tip-toes as he takes a deep breath. This position is maintained for a few seconds, then the lungs are slowly emptied as the heels are slowly lowered to the ground. The same rule applies to the number of times it is repeated. The patient is also encouraged to try and increase the length of time during which the breath is held at the end of full inspiration.

Wheatley and Moore (464) dealing with the effect of special exercises on children of poor posture and physique but without symptoms, find that in severe cases no real improvement may be expected under two years, and that in really severe cases actual regression may occur instead of improvement.

In individuals with symptoms, it is obvious that exercises where indicated must be continued over a very long period before improvement is to be expected. A question which continually arises in these cases is whether they should be fitted or not with an abdominal belt, of which there are such a large variety on the market. These date from the period when it was

assumed that the patient's symptoms arose from the malposition of the abdominal viscera, and that a properly fitting belt restored them to a normal position. We now know by X-ray examination that even the best fitting belt makes no difference to the position of the viscera. Recently it has been suggested its efficiency depended upon increasing the intra abdominal pressure, but my impression is that it very largely works by a process of suggestion and acts more as a mental prop than as an abdominal support. For this reason I have never found it necessary to order one for any individual under twenty-five years of age. In young adults graduated exercises develop general muscular tone sufficient to keep them comfortable. In cases which have drifted on past twenty-five or have developed after that age, I find the neuro-muscular apparatus as a rule fails to recover its full efficiency by exercises alone. Some of these cases may be completely relieved of all other symptoms except one, namely a feeling of weakness and sinking in the hypogastrium. In them a snugly fitting belt, by removing the last of their abnormal sensations, completes a symptomatic cure which would be impossible to achieve without it.

(c) DIET

Dietetic faddism has been ever prevalent in medical as in lay circles. The present age is no exception. Before the days of metabolic research, empiricism declared this article of food to be good

and that to be bad. In recent times the experimental findings of the laboratory have been carried boldly over into the realm of clinical medicine, and the results in the animal uncritically applied to the human subject. The consequence is that, whereas we find fairly general agreement amongst physiologists regarding their experimental findings, we find nothing but controversy amongst clinicians. If this be the state of affairs regarding the natural food of man in health, how much more so is it the case in the therapeutic adjustment of diet. The Salisbury diet, sour milk, B. acidophilous have had their day, to be replaced for the moment by roughage and vitamins. It seems to be forgotten that man has attained his present supremacy in the animal kingdom with an alimentary tract which has successfully handled and maintained health on a greater variety of food stuffs than any other animal. His ability to do so should be regarded as a function of health and our aim in the treatment of these cases should be as far as possible to restore this efficiency.

The patient when first seen usually has already made attempts to adjust his diet since as a rule, with the onset of symptoms, he found that some article or other did not agree with him. After omitting the article, symptoms abated for a short time, only to return; then another article was incriminated, omitted and the same result followed. In severe cases the individual may have attained even an actual starvation

diet before seeking advice. On the other hand, he may have adopted one of the prevailing fashions and have been filling an irritable colon with residue from fresh fruit, raw vegetable, and bran bread, and wondering why he felt more miserable than ever.

It should be pointed out to the patient that whereas a healthy man may thrive on a wide variety of food stuffs, others, of which he may be one, have a very reduced capacity in this respect and that health is to be attained, not by adopting this or that theoretically perfect diet, but by a process of trial and error, always remembering that one man's meat is another man's poison. Stress is then laid upon the simple essentials which are necessary for healthy digestion in all individuals. Sufficient teeth and efficient mastication, adequate time for each meal, with, if possible, a period of rest before and after each. The avoidance of a heavy meal when tired and fatigued, of working long periods without food and the necessity of regular hours, must be insisted upon.

Some simple explanation is then given why a definite diet is being prescribed. It should be stressed that the diet prescribed is not to be a permanent one, but will be continued only until the gastrointestinal tract has returned to normal, and that this will certainly happen if easily fermentable food stuffs and articles which leave a coarse irritating residue are avoided temporarily. A suggested menu is as follows:-

BREAKFAST - Porridge from Robinson's groats, farina, Force, chocolate or cocoa, eggs (poached or lightly boiled only), ham, bacon, rusks, dry crisp toast, ryevita, butter.

LUNCH and - Clear and cream soups, any meat, fish, chicken, or game - except duck, veal, pork, crab, lobster, and oysters. No made-up, smoked or seasoned meat, etc. Rice, potatoes, macaroni, spaghetti, spinach, asparagus tips or any other vegetable that can be pureed. No vegetable to be taken which cannot be completely freed from fibres before serving. Starchy vegetables to be taken in great moderation. Simple puddings, custards, sponges, may be taken; also plain cake and cream cheese. Fruit juice.

The essential point is that the patient does not eat coarse foods with fibre, skins, seeds, or gristle. He must not eat salads, celery, tomatoes, cucumber, pineapple, nor most of the green vegetables, nor any raw fruit, nor such things as raisins, nuts and jams full of seeds. At the same time sugar and starch is cut down to a minimum to lessen fermentation. Seasoning and condiments must be forbidden and the

patient encouraged to take meat, fish, and game in the simplest form.

As regards the intake of fluid, this should not be forced, and thirst alone should guide the quantity taken. Smoking and alcohol are forbidden.

As soon the patient feels quite comfortable, he should be encouraged to experiment by adding one article at a time of the previously forbidden foods with a view to testing the ability of his intestinal tract to deal with it. In mild cases, in time, an ordinary diet may be attained. In severe cases, this is not possible. It should be pointed out to such patients that they are not as other people, that they cannot tolerate an ordinary mixed diet, and that they must accept this state of affairs and keep within the dietetic limits which keeps them comfortable. Fortunately all these cases stand fats well so that the body weight is easily maintained by extra cream, butter, etc., and those who cannot tolerate fresh fruit may take strained fruit juice.

(d) DRUGS

Constipation, which is such a terror to these patients, may require some assistance from drugs, although in the majority of cases the best preliminary treatment is a cessation from the excessive purgation they have been indulging in. A suitable smooth diet in mild cases is sufficient in itself to cure the constipation. In severer cases, it is my custom to prescribe liquid paraffin 2

ounces a day in divided doses until it begins to ooze from the anus and then to reduce it daily until it has ceased oozing. This dose is then continued for a period of three months before any attempt is made to reduce it further. In some cases the liquid paraffin simply oozes away without helping defaecation in the slightest. For these, an infusion of senna made fresh daily by soaking the pods in cold water for 12 hours is prescribed in addition to the maximum dose of paraffin that does not ooze. Each patient has to find out for himself the number of pods which will secure a natural action without pain or discomfort. Before starting it is essential to see that the colon and rectum is cleared out by a simple enema. In many old standing cases seen late in the stage of chronic invalidism, the enema habit may have become a permanency. Every effort to break them off it frequently results only in great mental and physical distress, and in such cases the only alternative left is to allow them to continue.

The only other drugs permitted to these patients is an alkaline carminative mixture of sod. bicarb. and mag. carb. levis with aromatics to relieve their flatulence. To it may be added in suitable cases a small dose of atropine which is especially valuable where spasticity is a marked feature of the constipation. Even this should be dropped the moment the patient begins to feel comfortable on the prescribed diet. In others a small dose of sod.

salicyl appears to act better than the atropine. A certain number cannot tolerate carminatives and nothing suits them better than a small dose of Sippy's powder after each meal.

If patients presenting the abdominal manifestations of constitutional inadequacy were recognised for what they are, and treated on the broad lines here suggested I believe the majority would be prevented from drifting into the severer degrees of chronic intestinal invalidism. Not all, for the reason that the severer degrees are accompanied by a psychic inferiority which prevents any co-operation with the physician in accepting facts as they are and attempting any adjustment to them.

This conclusion is based upon the following figures which shew the results of treatment in the cases here reported. "Cured" represents cases restored to full economic efficiency; "improved" those comfortable as long as they continue on the lines of adjustment; "relieved" those comfortable but liable to relapse from time to time.

<u>GROUP I</u>	<u>41 Cases.</u>	<u>Males.</u>	<u>Females.</u>
Cured		Nil	Nil
Improved		3	4
Relieved		2	12
Not Relieved		-	20

<u>GROUP II</u>	111 Cases	<u>Males</u>	<u>Females</u>
Cured		12	48
Improved		3	25
Relieved		-	13
Not Relieved		-	10

In Group I the twenty unrelieved, and five of the relieved had all some form of surgical interference.

In Group II the ten unrelieved represents the type of patient who is incapable of co-operating. The thirteen relieved, on the other hand, are cases who co-operate to the best of their ability, but whose inadequacy is so great that little can be expected from any line of treatment.

The theory of chronic intestinal invalidism here advanced may be unsatisfactory in several of its aspects. Nevertheless the recognition of the fact that its treatment should be essentially preventive would do much to reduce the large amount of vague ill health which exists amongst the general population at the present day. This is not to be obtained by applying the results of any one special line of investigation, but by the judicious selection and application of all which have a bearing, no matter how remote, on individual well-being. In this the general practitioner should play the most important role, since he alone possesses the key to that very real entity the patient's constitution.

CONCLUSIONS

In our present state of knowledge it would seem legitimate to draw the following conclusions from this review of visceroptosis and allied conditions in their relation to chronic invalidism:-

- (1) The position of the viscera within the abdomen may vary to a considerable extent and yet be well within the range of normality.
- (2) There is no necessary relationship between the body build of the individual and the position of the abdominal viscera beyond that imposed by mechanical necessity. That is to say, *ceteris paribus*, the organs will be higher in a short broad abdomen than they will in a long narrow one.
- (3) There is a considerable range of movement of the hollow viscera which is normal for any given individual, so that their actual position in health may vary from time to time.
- (4) This variation in position may be brought about, either by physiological factors or by psychical ones.
- (5) The position of the viscera, per se, plays no part in the production of symptoms. It only does so in rare cases when associated with a true abnormality, as for instance, an aberrant renal artery.

- (6) While one or several of the symptoms discussed may appear as transient phenomena in any individual, their persistence is only met with in those of a special constitution.
- (7) This constitution is not associated with a special body build, but rather with a state of nutrition and state of mind.
- (8) This state of nutrition betrays itself in the tall thin individual by underweight, and in the short broad individual by overweight. In both it is accompanied by poor muscle tone leading to postural defects. The state of mind reveals itself by abnormal mental re-
actions.
- (9) The association of malnutrition, poor muscle tone, and abnormal mental reactivity, is characteristic for this group of cases.
- (10) This association appears to depend on a congenital, possibly inherited, inability of the individual to adapt himself satisfactorily to the various strains and stresses of life.
- (II) One of the failures of adaption may be lack of resistance to degrees of infection and toxæmia which have no effect on normal individuals. This may account for the failure to discover the "toxin" present in cases of autointoxication.
- (12) When sensations from malfunctioning viscera rise into consciousness in an individual who

is the subject of repressions based upon an inferiority complex, these tend to be utilized in the form of symptoms to reinforce the repression. The malfunction may originate peripherally from local causes as improper feeding, etc., or centrally from weakening of inhibition produced by fresh mental conflicts.

- (13) Later, with the establishment of a vicious circle of malfunction-symptoms-malfunction, actual tissue changes may occur in the affected organs rendering them incapable of a return to normal function.
- (14) When this occurs, there is little chance of restoring the individual to his or her particular standard of health.
- (15) The treatment of the condition is essentially preventive.

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